73 Amateur Radio Today

DECEMBER 1995
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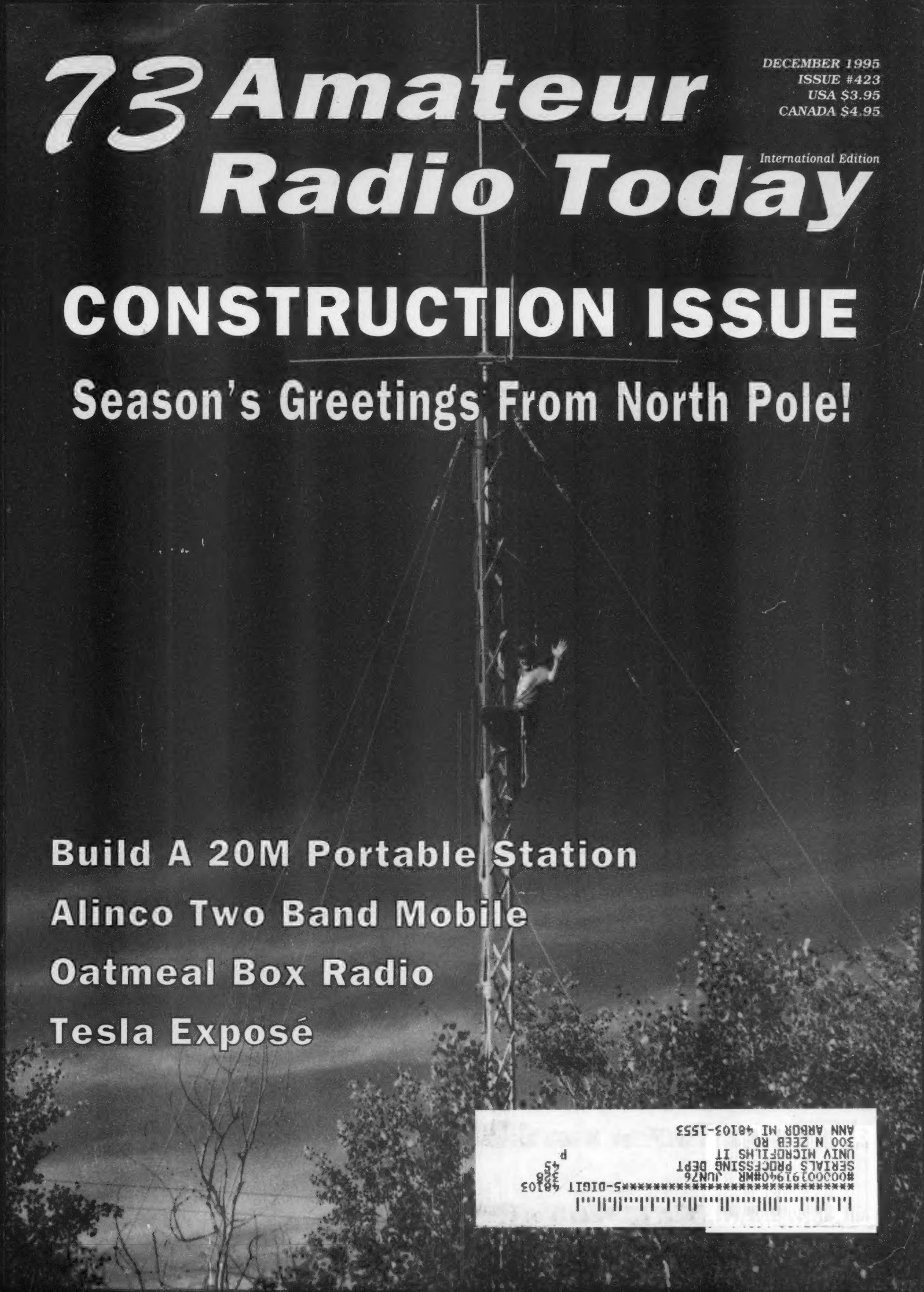
International Edition

CONSTRUCTION ISSUE

Season's Greetings From North Pole!



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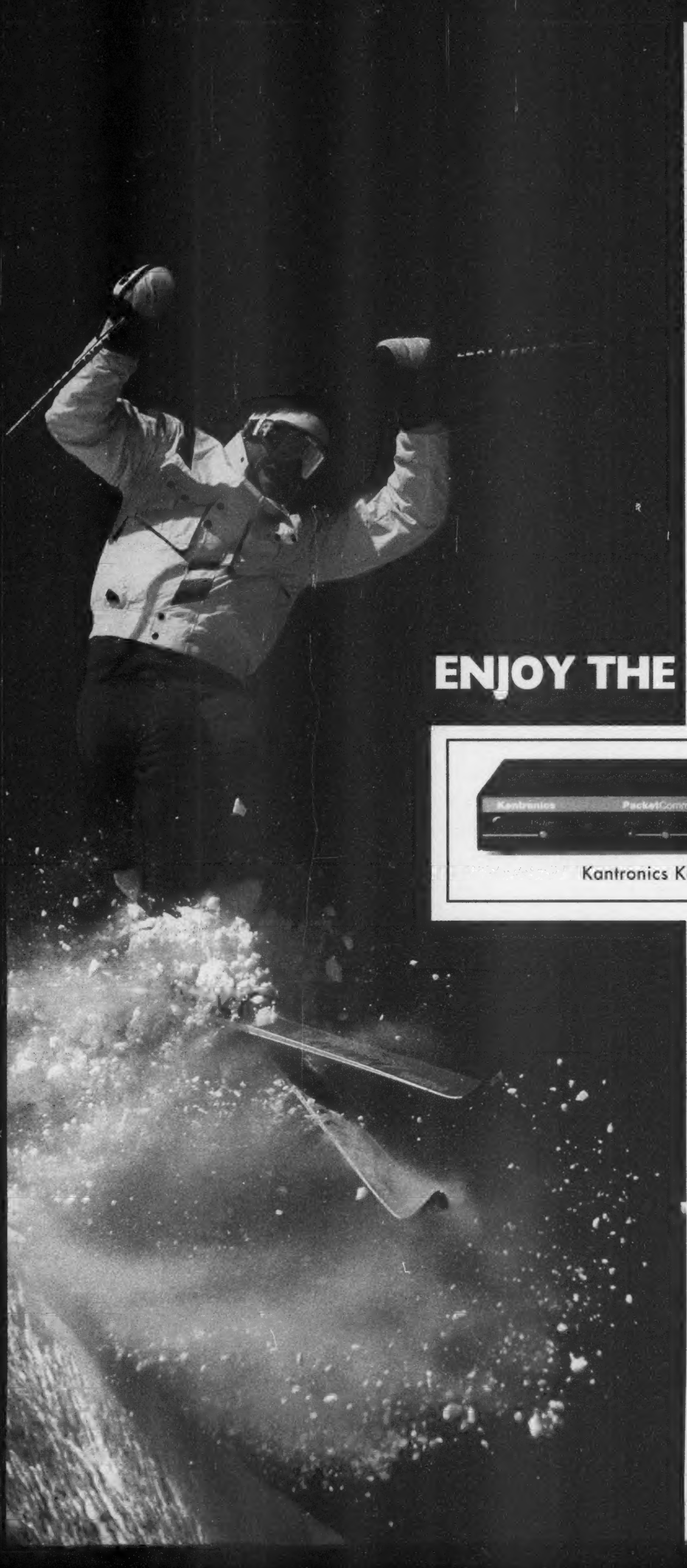

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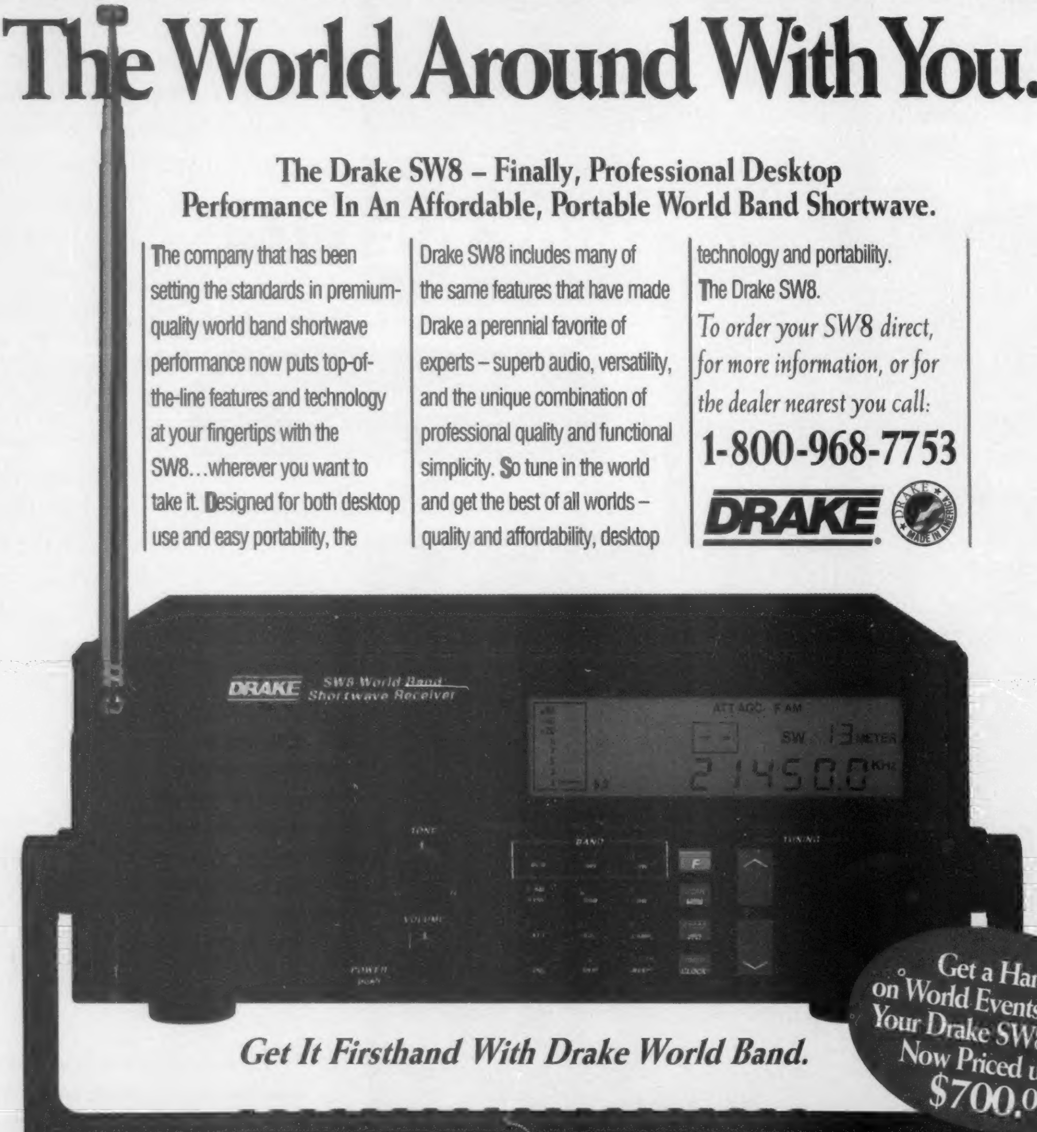

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DECEMBER 1995
ISSUE #423

73® Amateur Radio Today

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On the cover: Season's Greetings From North Pole
This month's cover photo comes from George Pataki WB2AQC, 84–47 Kendrick Place, Jamaica NY 11432. George visited 90 amateur radio operators in 15 localities, and took 640 photographs during his summer, 1994 tour of Alaska. Our cover photo from the town of North Pole, Alaska, features Joel WL7AI sending us Season's Greetings from his very tall and well-anchored tower sporting a three element Yagi and his repeater antenna. Also in North Pole, George met Eric KL7AJ and his 16 year old son David WL7NK and the family of Ed KL7XD, his wife, Sandy WL7PQ, their daughter, Danielle WL7QW, and their two sons, Bill KL7TC and Mike, KL7YY who send their Season's Greetings as well.

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is the page number on which the article or column starts as shown in the index.

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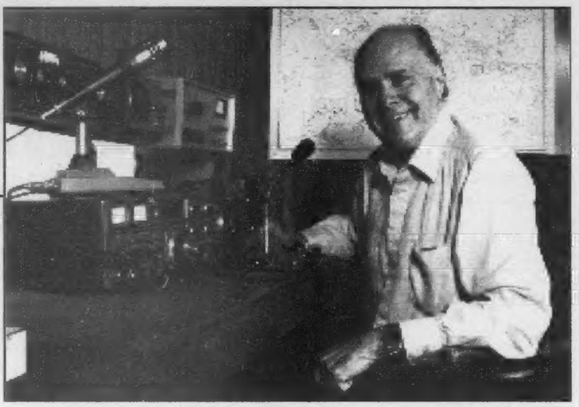
NEVER SAY DIE

Wayne Green W2NSD/1



Builder's Alert!

If you're not into designing and building little electronic gadgets, skip this, it's not for you.

It all started when an envelope arrived with a little bag of hardware in it. Oh, I'd seen the Sescom ads, but I hadn't really understood how neat their equipment boxes were. I spent a lot of years at the workbench making all kinds of electronic stuff, but nothing as cute as these had ever been available. Considering the size parts used to be, nothing I could have made back then would have fitted into most of these boxes.

So I contacted Sescom to see if they might be interested in me helping them get the boxes better known. Not being crazy, they agreed. Here's the deal. For any article I publish that uses one of their boxes they'll send a $50 check to the author, and that's in addition to the pittance I shell out for good construction projects. A little bonus. Well, since their boxes only cost from $2 to $6, that's a good gamble for any builder.

Don't go away, I'm not done.

Sescom also makes some remarkably inexpensive modules for various audio applications. SIPs. These are also cute little buggers. If you can figure out some hamshack applications for these and come up with an article I can't refuse, Sescom is offering a $100 reward, plus whatever you can squeeze out of Never Spend a Dollar.

There are 23 varieties so far, ranging from $15 to $35; things like mike pre-amps, remote volume control, automatic level controls, etc. These miniature circuit boards aren't much larger than ICs.

I'm still not done.

Sescom makes most of their SIPs in fairly short runs, so they don't need to have a market for tens of thousands to be interested in making more SIPs available. What they need is for you to brainstorm a small circuit and send them a prototype. If they like what you've done they'll swing into action and add it to their catalog, with you getting $100 up front for the idea, plus a royalty on every sale. And I would expect, at the very least, an article from you on your handywork. With good photos.

If your brain is all fogged up due to your poisoning yourself with mercury (fillings), Big Macs, Nutrasweet, Bud Light, and so on, then you can substitute some research into ham rag back issues for the creativity you'd otherwise have.

Sescom is mostly into audio circuits, but with your help maybe we can get them to start making some RF modules. Maybe some digital too. I'd love to have a module that would send my call digitally every time I push the mike button. At 9600 baud it would zip by like that. Then I'd want another module to decipher the signal when it's used by others. The next thing you know we'd start seeing some of the big companies building this into their rigs, with a little LCD readout on the receiver giving the call of the station you're receiving.

What else do you need?

How long will it be before we have a module in our rigs that we can load a digitized picture of ourselves into? That takes me back to the early slow-scan days around 1970, when I had three cameras set up in my shack, with one aimed at a menu board, a second at a slide projector, and the third at me. And there was this guy in Caracas who used to send hours and hours of Playboy centerfolds.

And the time when I went to Navassa to operate as KC4DX and took along some slow-scan QSOs on audio tape, plus a recorder to see what I'd received after I got home. I remember calling in on the slow scan channel on 20m and being told to go away because there was (wow!) a Mexican station on there that everyone wanted to contact. So I moved up the band and gave a few of the more alert slow-scanners a new country, while the herd were working that Mexican SSTV station.

Get out your soldering pencil and let's see what you can do to have some fun and maybe even get Sescom better known.

Reminder For Skiers

Snow permitting, am I going to see you at Aspen January 4–11th, HT in hand so we can talk while on the lifts? That's the low season at Aspen, when prices are reasonable and the lift lines minimal (or less). And think of the fun we'll have solving amateur radio's problems over some delicious dinners. Mmm. We've had mini-hamfests at Aspen for many years and had a ball. Skiing is half price if you're over 65, and free at 70. There probably are some better places in the world to ski, I just haven't found them yet. Let me know via fax: 603-588-3205 or via ProFusion@AOL.com.

Cuban QSLs

A letter from Thomas Hark KB8TAG enclosed a note he'd gotten from Oscar CO2OJ, explaining about his problem getting QSL cards, even though they've been sent to his post office box in Cuba. Oscar has been busy this last summer working American grid squares on both 2m and 6m via tropo and sporadic-E, hoping to be able to get the VOCC award. But with 75–80% of the QSL cards not making it through the Cuban postal system, he's not getting the needed confirmations. A big part of the problem may be the $1 and $5 Green Stamps enclosed as incentives for a fast response. I suspect Oscar could get 100% of his wanted cards if he lined up an American QSL manager.

DXers can do well with Green Stamps if they can actually get their mail. I remember talking with Don Miller W9WNV back in the 1960s when he was going around the world DXpeditioning. He claimed that he was making over $50,000 a year charging for QSLs, with no income tax, since there was no way for the IRS to find out about it. And that would be more like $500,000 in todays dollarettes. Say, does anyone know if Don's out of prison yet?

Too bad if you missed the fun last summer on six meters. Many days it was hotter'n a pistol. With the sun spots cranking up, how about getting set up to have some DXing fun on 6m next summer?

Wayne Wrong On EMFs!

Well, that's what a lot of readers have been saying, putting me down as just another hysterical eco-nut. After all, they've been saying, if there was any real problem the Health Department or the EPA would have acted long ago. Sure, like they've whipped into action in the case of cigarettes, which are a long-proven cause of sickness and death. Heck, cigarettes kill more Americans every year than AIDS, drugs, automobile accidents, and murders combined. But is that enough to warrant action? Not when the tobacco

Continued on page 74

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Gain & Wave: 146MHz 2.5dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 3 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO •
Max Pwr: 120W

CX-224/CX-224NMO • Tri-band 146/220/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 220MHz 3.5dBi 5/8 wave • 446MHz 6.0dBi 5/8 wave x 2 •
Length: 36" • Conn: CX-224 PL-259, CX-224NMO NMO • Max Pwr: 100W

B-20/B-20NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.0dBi 5/8 wave x 2 • Length: 30" •
Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W

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LETTERS

From the Ham Shack

Mike Carbaugh WA3HDQ First a little background info. I've had my ticket since 10th grade in 1967. I worked a lot of 6 meter AM and 2m FM, back when 2m was fun. Seems like now-a-days each repeater has its own little "group." But I still use an HT in the car. I commute 52 miles one way and it's nice to have.

I faded away from Ham Radio back in the late 70s. Since Techs were given 10m, I got back on the air in 1992. I run a barefoot-no frills station consisting of (1) Kenwood 520SE and Realistic HTX 100, mobile 10m; (2) 10m vertical; (3) HQ Mini-Quad, 6, 10, 15, 20 meters. (4) Coaxial dipole for 40m. Thanks to *Radio Fun*for info on construction. (5) Just purchased a PK-88 TNC; (6) searching for PC or Dumb Terminal. (7) Joined AMSAT and listen to the "birds." (8) Realistic HTX 200 m HT.

Some random thoughts for newer ham and others. (1) 2m/10m crosslink repeaters are a lot of fun. Try them out if any are in your area. (2) send an SASE or postage when QSLing. (3) Clubs do more for newer or lower grade licensed hams - let them do some operating at field days, during contests and special events. Loosen up the meetings, don't hold every one strictly to business. (4) Don't be so quick to point out a newcomer to the repeater made a mistake and said "Break." (5) Look what Techs and Novice did to activity on 10m! Allotment of more privileges on HF bands could increase our amateur ranks. (6) My last 125 10m contacts: 63 were Tech or Novice; 20 General class; 24 Advance class; 18 Extra class. (7) Seems to me everyone is taking advantage of Tech Plus and Novice activity on 10m. (8) What could we bring to other HF bands? 15 meters?

One final thought: I agree with you and so do many other silent hams - to "Hell with the Code." It's holding many good potential ham back.

Steven Katz WB2WIK/6. Your October editorial in 12 re "Money Ideas," etc., brought to mind something that many hams know about and very few capitalize on. Many hams, including you and me, are PC nuts who have been there since the beginning. I had a "Sol" in 1976, followed by my first "real" PC, an Apple II, in 1978. First DOS system (IBM-PC) in 1983. Lacking available software in the early days, I wrote a lot of BASIC programs myself, as I'm sure you did. I now work in the PC peripherals industry and my office is in a building originally built and occupied by Pertec, the first real hard disk drive manufacturer in the U.S. They became part of DDC and then finally folded some years back, but Pertec launched a lot of businesses, including Micropolis (also here in Chatsworth, CA), Tandon and others. I feel like a dinosaur in this industry that is only maybe 18 years old. Sigh.

The business opportunities in PC peripherals are abundant. With read-write optical media and mechanisms becoming so affordable, floppy disks will soon be a thing of the past. Hard disks are already at 9 Gb and Micropolis (and probably others) are developing 18-19 Gb drives right now. RAID systems (Redundant Arrays of Independent Disks) for fault-tolerant data storage are becoming so popular that "hackers" already have them, including systems capable of storing 63 Gb of data in fail-safe setups that can't lose a single Byte of data even in a disk "crash." Pinnacle Micro and others are introducing 4.6 Gb optical read-write mechanisms with very affordable media. Where will it end? Nobody can possibly predict, but there's surely no end in sight.

My 4-1/2 year-old daughter knows how to operate Windows 95. The information superhighway is alive and well, and anyone who isn't on the Net is almost passé. I think the latest figures indicate some 35 million users on the World Wide Web, and this is bound to double in the next year or two. Highly competent PCs for less than pocket change abound in the marketplace. How can hams cash in on this? It's obvious. Networking and performing value-added retail services. The whole industry is so simple to understand that it's populated mostly by folks who barely graduated high school. CD-ROMs are almost a thing of the past, since recordable CD mechanisms have become both available and affordable. Pinnacle's new Apex 4.6 Gb drive is priced within reach of anyone who can buy lunch, and as prices continue to drop there will be no reason the average hacker can't afford a 14-disk array jukebox for home entertainment. But end users are so silly they will continue to need integrators who are added-value resellers. And many folks would like to be part of the Web, but have no idea how to get on.

This is a fantastic business opportunity for thousands of hams who have any inkling whatever about how to set up a PC with a modem and get on line with an Internet provider. It's child's play, and as amazing as it sounds, thousands of slightly technically-inclined individuals are making a great deal of money being part of the Superhighway. Mind you, these are short-term opportunities. Technology progresses faster than most of us can keep up, and many might have to be satisfied making their first million in the next year or two and then retire to operating from Tahiti.

It's progressing faster than most could possibly imagine or keep up. But the money is available and there for the taking for enterprising folks who don't mind working. It doesn't take any financial investment, only the time to study and keep abreast of the rapidly changing technology. Banks, insurance companies, law firms et al, all need fault-tolerant data storage. How many hams are in this field? Raise your hands. Pity. Not very many. Tsk.

It's no good Steve, 20 years ago I tried hard to get hams to take advantage of the exploding computer field. The industry grew at 235% a year for its first seven years, just as I'd predicted. Thousands of people made millions. Some made billions. But you're right, the industry is still growing fast and shows no sign of slowing down, so there's plenty of money out there for manufacturers, programmers, consultants, and service providers. Any ham could live in a dream ham location and have a dream ham station, if he wanted to. All it takes is some self-education in computers and the gumption to do it. It doesn't take a lot of brains to be a computer Ph.D., just some work. Wayne.

Michael Forinash KB0RIA. Wayne, I've only been reading *73* for two years, but I think you're doing a fine job. No complaints. Suggestions? Why not run an occasional photo of vintage equipment on the cover? I missed out on the 20s, 30s, and 40s, but I love looking at equipment from those periods. And how about more QRP projects?

Anyone got a good photo of a mint SW-3 or a Skyrider Diversity we can run on the cover? Wayne.

Sid Choudhry KK6RN. I noticed in the September cover picture of your shack that you have a Palomar PT2500 antenna tuner just like mine. I've been looking everywhere for a manual for this tuner. Even Palomar hasn't been able to find one. I wonder if you have one you could copy for me? *Nope, mine's long gone, but I'll bet one of our readers can help. Sid's at 2487 Cliff Road, Upland, CA 91784. Wayne.*

Frank Rumph KD4DZI. Wayne, a while back you asked hams to be courteous. A lot of them are nasty to each other on the air and the newspapers are telling us that violence has increased alarmingly among our youth since 1983. This was when Nutrasweet was introduced. Coincidence? Aspertame has been called a mind-altering drug and I've seen its effect on my wife after eating just one package of diet Jello pudding. Coincidence? I just use Ivory soap to wash my hair and my sense of smell is working fine. We had a policeman come to our ham club to talk about crime. He said if you use Mace on a person who has taken drugs it makes them more violent.

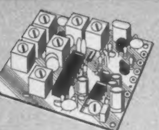
Nutrasweet (aspartame) looks to me like proof positive that money buys the FDA, just like it does our congress. Endless reports of it's side effects show it can be devestating. Perhaps we should ask that any ham who has downed a diet cola or soda not operate for 24 hours. That might even clean up 14,313. But would it keep K1MAN off the air? Wayne.

Kintzonidis Sriros SV2BXC We had a tremendous 2m band opening on June 2nd. I was running 50 watts and got a 59 from F5NZO and then again from F5IRS, a path of about 2280 km! Then I worked F1CCB, HB9JAW, HB9RSO, and HB9SNR, all on 144.250 using FM. The sporadic-E was so strong I could hear HTs and it lasted for about an hour

Continued on page 82

WWV RECEIVER

NEW

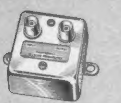


Get time & frequency checks without buying multiband hf rcvr. Very sensitive and selective xtal controlled superhet, dedicated to listening to WWV on 10.000 MHz. Performance rivals the most expensive receivers. .... **only $59 kit, $99 w/t.**

LOW NOISE RECEIVER PREAMPS

LNG-(*)

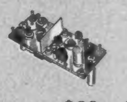
still only $59
wired&tested



FEATURES:

- **Very low noise:** 0.7dB nf vhf, 0.8dB uhf
- **High gain:** 13-20dB (depends on freq)
- **Wide dynamic range** - resist overload
- **Stable:** dual-gate GAS FET

**Specify tuning range: 26-30, 46-56, 137-139, 139-152, 152-172, 210-230, 400-470, 800-960 MHz.*



LNW-(*)

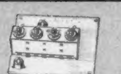
MINIATURE PREAMP

still only $29 kit, $44 wired&tested

- **Low-cost** MOSFET preamp.
- **Small size**. Only 5/8"W x 1-5/8"L x ¾"H.
- Nf 1.2dB vhf, 1.5dB uhf.
- Solder terminals for coax & pwr connect.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, 400-500 MHz.*

HELICAL RESONATORS

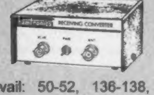


Helical resonator filters may **reduce your intermod & cross-band interference.**

MODEL HRF- (*), ***$59 vhf, $99 uhf.***
**Specify tuning range: 136-140, 142-150, 150-162, 162-174, 213-233, 420-470.*

RECEIVING CONVERTERS

Low noise converters to receive vhf & uhf bands on a 10M receiver.

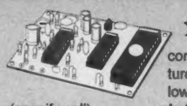


- Input ranges avail: 50-52, 136-138, 144-146, 145-147, 146-148, 220-222, 222-224 MHz, 432-434, 435-437, 435.5-437.5, and 439.25 (atv conv. to chan 3).
- **Kit less case *$49*, kit w/case & BNC jacks *$79*, w&t in case *$99*.**

TRANSMITTING CONVERTERS

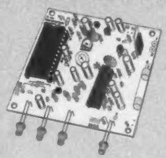
XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 432, 435, and atv. 1W output. **Kit only $89 (vhf), $99 (uhf).** *PA's up to 45W available.*

REPEATER CONTROLLERS



NEW **CWID-2.** Epromcontrolled, miniature, easy to build, low power CMOS, (specify call) .... **only $54 kit, $79 w/t**

COR-6. COR & Real Voice ID on one board. Digital ic records up to 20 seconds of your voice. Can record multiple id messages. Tail and time-out timers, courtesy beep, solid-state relay to key transmitter. .... **kit $99, w&t $149**



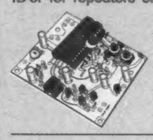
COR-3. COR, timers, court.beep .... **kit $49**

CWID. Diode programmable .... **kit $59**

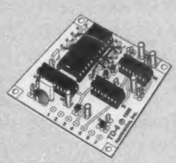
COR-4. Complete COR and CWID all on one board. CMOS logic for low power consumption. EPROM programmed; (specify call) .... **kit $99, w&t $149**

ACCESSORIES

DVR-1 DIGITAL VOICE RECORDER. Records up to 20 sec. of your voice with built-in mic. or external mic. Terrific as voice ID'er for repeaters or fox hunt xmtr, contest caller, radio notepad, etc. Extensive manual tells how to use multiple messages adapt to many applications. ......**kit $59, w&t $99**



TD-4 SELECTIVE CALLING MODULE. Versatile dtmf controller with 1 latching output. **Mutes speaker until someone calls** by sending your 4-digit tt code. Or use it with a **long tt zero** digit to alert anyone in club for emergencies. Also may be used to **control autopatch or other device**, like TD-2 except only one output. .... **kit $49, w&t $79**



TD-3 CTCSS DECODER/ENCODER. Prevents access to repeater or receiver unless proper tone is present. Tone output for transmitters, too. .... **kit $29, w/t $59**

AUTOPATCHES

AP-3 REPEATER AUTOPATCH. Reverse patch and phone line remote control. .... **kit $89, wired & tested $139**

AP-2 SIMPLEX AUTOPATCH Timing Board. Use with above for simplex operation using a transceiver. .... **kit $39**

TD-2 DTMF DECODER/CONTROLLER. 16 digits, jumper-programmable, toll-call restrictor. Can turn 5 functions on/off. ....**kit $79, wired & tested $129**

DATA MODEMS

MO-202 FSK DATA MODULATOR & DE-202 DEMODULATOR. Run up to 1200 baud digital signals through any fm transmitter & receiver.....**kits $49, w&t $79**

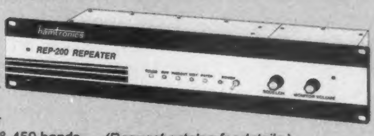
9600 BAUD DIGITAL RF LINKS. Call for info on low-cost packet networking system: MO-96 Modem and special versions of our 144, 220, or 450 MHz fm xmtrs and rcvrs. Use directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

You get more features for your dollar with our

REP-200 REPEATER

A fully microprocessor-controlled repeater with autopatch and many versatile dtmf control features at less than you might pay for a bare-bones repeater or controller alone!

Kit still only $1095
w&t still only $1295
50 & 900 MHz bands slightly higher



- Available for the 50-54, 143-174, 213-233, 420-475, 902-928 MHz bands.
- **FCC type accepted** for commercial service in150 & 450 bands. *(Request catalog for details.)*

REP-200T Voice Message Repeater. As above, except includes Digital Voice Recorder. Allows message up to 20 sec. to be **remotely recorded off the air.** Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements!**......................**adds only $100!**

REP-200C Economy Repeater. Uses COR-6 Controller (no DTMF control or autopatch). Features **real-voice ID**. ....**Kit only $795, w&t $1195**

REP-200N Repeater. Want to use your own controller? No problem! We'll make you a repeater with rf modules only. .... **Kit only $695, w&t $995**

XMTRS & RCVRS FOR REPEATERS, AUDIO & DIGITAL LINKS, TELEMETRY, ETC.

Also available in rf-tight enclosures, and with data modems.

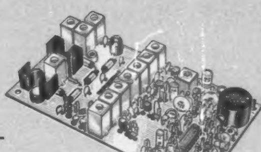
FM EXCITERS: 2W continuous duty.
FCC type accepted for com'l bands.

- **TA51**: 50-54, 143-174, or 213-233MHz.
- **TA451**: 420-475 MHz . *New low price!*

Either model: ....**kit $99, w/t $169.**

- **TA901**: 902-928 MHz, (0.5W out);

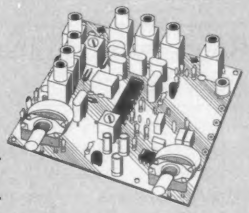
New low price! .... **w/t $199.**



VHF & UHF AMPLIFIERS.
For fm, ssb, atv. Output levels from 10W to 100W. Models **starting at $99.**

FM RECEIVERS:

NEW **R100 FM RECEIVERS** for 46-54, 72-76, 140-175, or 216-225 MHz. **Very sensitive** – 0.15uV, **exceptional selectivity** – both crystal & ceramic if filters for >100dB at ±12kHz (best available anywhere), **flutter-proof** squelch. ....*New low price!* **kit $129, w/t $189.**



- **R451 FM RCVR**, for 420-475 MHz. Similar to above. *New low price!* **kit $129, w/t $189.**
- **R901 FM RCVR**, for 902-928MHz. Triple-conversion. *New low price*.... **$159, w/t $219.**

NEW **R150 MONITOR RCVR** for 143-164 or 216-225 MHz. 4-channels. Great for monitoring repeaters, amateur calling frequencies, packet radio, commercial two-way radio, police/fire frequencies, or weather forecasts. **Good starter kit**, easy to assemble and align....... **kit only $99, w/t $189.**

- **R120 AIRCRAFT RCVR** for 110-136 MHz .... **kit only $99, w/t $219.**

WEATHER SATELLITE RECEIVER

hamtronics
R139 WEATHER FAX RECEIVER
SCAN
POWER
STEP AUTO MAN
OFF-ON
VOLUME
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R139 Is The Affordable WeSat Rcvr!

NEW

Join the growing ranks of amateurs who get striking images directly from the weather satellites! We used our 30+ years of experience in designing high-quality vhf receivers to bring you a new enhanced version of our long-popular WeSat receivers. The new R139 is a very sensitive wideband fm receiver optimized for amateur reception of NOAA APT and Russian Meteor weather facsimile images on the 137 MHz band. Use with any popular demodulator and software. Covers all five popular satellite channels. Scanner circuit and recorder control allow you to automatically search for and tape signals as satellites pass overhead, even while away from home.

- **R139 Receiver Kit less case** **$159**
- **R139 Receiver Kit with case and 12Vdc power adapter**..........................**$189**
- **R139 Receiver Wired/tested in case with 12Vdc power adapter** **$239**

- Buy at low, factory-direct net prices and save!
- For complete info, call or write for free catalog. *(Send $2 for overseas air mail.)*
- Order by mail, fax, or phone (9-12 AM, 1-5 PM eastern time).
- Min. $5 S&H charge for first pound plus add'l weight & insurance.
- Use VISA, Mastercard, Discover, check, or UPS C.O.D.

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QRX . . .

New 2m DX Record!

Tropospheric ducting resulted in some great DX for the alert, with the path opening between Hawaii and the West Coast at the end of June. Too bad if you missed it. The best DX was between Paul Lieb KH6HME, operating atop Mona Loa (13,680 feet) on the main island, and Jim Costello W7FI in Woodinville, Washington, up near Seattle. That's a distance of 2,692 miles. That was just a tad further than Pau's contact five years ago with XE2GXQ, on Baja California. Paul also worked WI7Z and N7KSI in Washington, and N7AVK in Oregon. VE7SKA heard Paul, but couldn't get through. Anyone want to bet that SKA won't have a bigger signal next year? KH6HME also made 432 contacts with K6QXY and W6SYA, but 2m was the hot band.

Launch contract for phase 3-D finalized

The Amateur Radio Satellite Corporation (AMSAT) has announced plans to launch the Phase 3-D satellite aboard the second flight of ESA's new Ariane 5 (Ariane 502) for approximately $1M US. The launch is currently slated for September, 1996, but if not possible could be shifted to an older Ariane 4 booster for launch by mid-1997.

Repeater Coordinators Meet

The nation's repeater frequency coordinators recently met with the ARRL and the FCC in St. Charles, Missouri. It was a politically charged meeting that has changed the face of VHF operation forever. This is because there is now a tentative agreement by which the American Radio Relay League has tentatively agreed, subject to board approval, to represent the nation's coordinators to the FCC. This, in exchange for the commission recognizing the work of the coordinators and possibly making their decisions binding on the ham radio community.

The meeting was held at the Best Western Noah's Ark motor hotel not far from the St. Louis Airport. About fifty of the nations sixty five recognized repeater coordinators were present. Also in the room were representatives of packet radio, amateur television and other modes that use the VHF and UHF spectrum, but from the outset it was made clear that this meeting was to discuss the problems of FM voice repeater coordination only.

Even though he was there unofficially, the tone of the meeting was set by the keynote speaker Ralph Haller, N4RH, Deputy Chief of the FCC's Wireless Telecommunications Bureau: "I'm particularly delighted that all of you have taken time from your schedules to be here and you have shown so much interest in this matter, that you would come to St. Louis on a Saturday.

I would like to ask that we try to stay focused. In talking to you, I know a number of you in this room have lots of other concerns. Enforcement, changes in the volunteer examine program, but that is not what today's meeting is about. Today's meeting is to talk about frequency coordination. An opportunity to get to really get to know each other. And it's an opportunity to bring frequency coordination to yet a higher plateau. So during the day let's stay focused on the real issue of why we are here. Let's not get side tracked on other issues that can easily take up the day. Let's stay focused on frequency coordination. This is a truly historic day in the history of Amateur Radio." Haller, N4HY

Historic yes, but not without its problems. For a while, the entire proceeding seemed to be slipping away as the political differences between various coordinators and between some coordinators and the ARRL took center stage. As a result, much of the early discussion derailed into matters of finite detail rather than the general picture that Haller had requested. So, not unlike other legislative bodies in a state of conflict, the group recessed. It was when the meeting reconvened that headway began. Owen Wormser, K6LEW, the president of the Mid Atlantic Repeater Council was the person who brought it back on track:

"For the sake of a beginning can we agree that those that are listed in the current ARRL Repeater Directory as coordinators for their specific areas etc. are in fact the baseline from which we can begin. Perhaps, but not the final solution, perhaps not the end of it, but can we agree that that is at least the beginning. Because where the next point goes is, if that is agreed then we have something else to say. And that is that in the longer term our objective is to produce the white paper which will be the assemblage its direction, it was Jim Fortney that added purpose:

"It has become very clear to me and I hope it would be clear to the majority of the rest of you, that the environment that the FCC finds itself in no longer allows us to use the methods and techniques that we have used in the past to deal with them. And that in fact that we better look at some new approaches. And one of those approaches that is being used elsewhere and has been suggested from a variety of directions that would be advantageous to us is if we, and I am talking about amateur radio, not repeater coordination necessarily, but amateur radio in total, we amateur radio had someone who represented us to the FCC." Fortney

Discussions and debates lasted another four hours. In the end it was decided to name the American Radio Relay League as the single point of contact, or spoc, between the nations frequency coordinators and the FCC. A committee chaired by Owen Wormser, K6LEW was empowered to draft a white paper setting forth the goals of the spoc. This paper will be circulated to all the nations recognized frequency coordinators listed in the ARRL repeater directory for comment before a final version is submitted. All of this seemed to please the FCC's Haller:

"Clearly this afternoon, I think tremendous progress has been made. And I look forward to continuing to work with this group and your representatives who will ultimately be working with us directly in Washington. I think this is a giant move forward for Amateur Radio and I think it says a lot that all of you come here with such diverse views and in the course of a few short hours reach this kind of consensus." Haller

There is still a lot to be done before recognition of the work of coordinators becomes reality. Two of the biggest hurdles are drafting a white paper acceptable to most coordinators and for the ARRL's Board of Directors to vote on whether or not it really wants the SPOC job. The latter will happen in mid January.

But assuming both of these tasks are accomplished, it may eventually mean that the average ham, people like you and me who simply operate FM with a mobile rig or an HT can be assured that the day of the so-called pirate repeater will come to an end. That our ability to communicate through our favorite repeater with a minimum of interference from another uncoordinated and unwanted repeater on the same channel pair, will be assured. And from a users point of view, what more can an FM enthusiast want.

FCC Closing Several Offices

The recent Republican economy drive has hit the FCC, which has never been generously funded. The result is the announced closing of their Regional Offices in Atlanta, Boston, and Seattle. The Field Offices in Anchorage, Houston, Portland, Buffalo, Miami, San Juan, Honolulu, Norfolk, and St. Paul will also be closed, as will eight of their monitoring stations. The most serious of those is the Norfolk Office, which was the training center for FCC agents for the whole country. No more "pink tickets" from Grand Island!

This presents an opportunity for amateur radio to offer to provide a new service for the FCC. We have thousands of handicapped and retired hams who would gladly volunteer to help monitor the spectrum as a public service. Since hams are everywhere, they could provide a more thorough monitoring service on LF, HF, VHF, and UHF than the FCC has had.

ARRL Seeks Enforcement Action

The ARRL may be headed to congress to try and force the FCC to enforce the Amateur Service rules. At least the rules that govern willful and malicious interference.

According to Minute number 3.1 of the recent Executive Committee meeting, on a motion presented by Director Joel Harrison, WB5IGF, League President Rod Stafford, KB6ZV has been directed to appoint an ad hoc committee to—and we quote: "develop objectives and strategies to achieve legislative solutions to the problem of inadequate enforcement."

This action was prompted at least in part by a report to the committee by League General Counsel Christopher D, Imlay, N3AKD. In his report, Imlay reported that progress on two egregious cases of repeater jamming have proceeded far slower than had been promised by the FCC staff. N3AKD also noted that the announced closings of FCC field offices along with staff cuts appear to have contributed to a deterioration in morale.

The FCC's internal problems not withstanding, the ARRL appears to have concluded that the commission has a constitutionally mandated responsibility to the American public. And since radio amateurs are a part of this constituency, the FCC has an obligation to enforce the rules it makes. If the agency fails to do so, then legislative action may have to be taken to make it happen.

Also noted in the committee minutes is RM-8626, a petition by W5YI Report publisher Fred Maia of Arlington, Texas. Minute 3.6 says that the petition which would outlaw most one-way high frequency transmissions was strongly opposed by hundreds of commenters and should be, dismissed

Imax Images Of Shuttle-Mir Available Via Internet

Hams with Internet access will find several dramatic new images highlighting the historic docking of the Space Shuttle Atlantis and the Mir space station are available on the World Wide Web. The high resolution images show crew activities and views of Atlantis taken from Mir recorded using a 70-mm IMAX camera.

Links to the collection can be found on the "Today at NASA Home Page" on the World Wide Web.

ARRL Honors NY Heros

The American Radio Relay League has given its highest possible honor to a New York area radio amateur. At its September 16th Executive Committee meeting in Albuquerque, New Mexico, the committee voted unanimously to present its National Certificate of Merit to Henry Borawski, KB2PFP. This for—and we quote—"the bravery of his actions in responding to the World Trade Center bombing."

According to ARRL Hudson Division Director Steve Mendelsohn, WA2DHF, Borawski used Amateur Radio to assist citizens trapped inside the World Trade Center after the bomb went off. Mendelsohn who sponsored the Borawski nomination says that the award was given in recognition of the professional manner in which KB2PFP performed his acts of heroism.

At the same meeting, the Executive Committee also took note of the heroic efforts of numerous Long Island, New York hams who donated their communication skills is assisting firefighters beat back a six thousand acre blaze. The committee singled out three hams, Section Manager Rick Ramhap, N2GQR, Section Emergency Coordinator Mario Maltese, WF2T and Suffolk County District Emergency Coordinator Andrew Feldman, WB2FXN, for special praise.

Fluke Oops!

If you have a Fluke Series II DMM, Model 21, 23, Kit-23, 70, 73, 75, or 77, Fluke wants to get it back to be modified. It seems that anything over 400 V, ac or dc, may indicate zero volts, which could lead one to get one heck of a surprise, if the reading is believed.

Israel Callbook

Shlomo Musali 4X6LM is preparing a callbook of Israeli hams activer on the Internet. Send internet addresses to: mussali@shani.net. You can get the Israeli Callbook on the 'net at: http://ww.qrz.com/cgi-bin/webcall.

From The Internet:Amateur Radio Newsline

Amateur Radio at the Technoda

The Technoda, a technical museum in Haifa, Isreal, is planning a full operational HF station with a 3 element Yagi antenna, a display of CW reception as well as satellite communication and packet radio.

ARRL Phone Change

The ARRL has new phone numbers as the result of an area code for Newington. The Prefix has changed to 860 but the previous area code, 203, will continue to work until September 1996.

DX

In DX, EI4BZ, informs us that he hopes to go mobile and activate some squares each Tuesday evening on 80 meters from 19:00 UTC. He adds that other mobiles are welcome to join in for a contact. QSL as directed.

And interest in the Worked All Ireland Award continues to grow. Quite a few amateurs are now operational on or around 3.670 MHz from 19:00 UTC time most evenings. If you are in the shack, do give a call on 3.670 as recent activity has seen up to twenty operators on the net.

What better present for a ham friend than twelve monthly reminders of your thoughtfulness?

Yes, a subscription to *73*. But you'll be giving yourself a gift too. For every gift subscription you handle for Santa, we'll send you a CD of the music type of your choice. First rate music. Check out the 26 types of music listed in Wayne's November editorial.

QSL Contest

Did you buy your QSL off a rack,
or did you put some thought
and creativity into it?
If you think you have
a winner,
send it in
and let us have
a look at it. Who knows,
it might make the cover.
Well, maybe page 85 or so.
Or maybe Wayne's wastebasket.
If it's declared a winner, you'll get a CD
of your choice of any of 26 kinds of music, as listed in Wayne's
November editorial. You'll also see it in 73! Send it to
QSLContest, 73 Magazine,
70 N202, Peterborough NH 03458-1107.
Bribery?
You Bet!

A Portable Integrated 20 Meter SSB/CW QRP Ham Radio Station

A ten pound powerhouse!

J. Frank Brumbaugh KB4ZGC

How would you like to put together a neat single package 20 meter ham station capable of being powered by either the normal 120-V commercial power or a 12-V battery? It occupies a volume of less than one quarter of a cubic foot, and its footprint is just a bit more than one quarter of a square foot. It weighs less than ten pounds, and a handle on top makes it easy to carry anywhere on trips, for Field Day, emergency operation during a local disaster, or nestled in the corner of any room at home.

This integrated ham station consists of four modules, stacked atop each other, and held together with aluminum straps. In order, from bottom to top, are the power supply and speaker module; antenna tuner (MFJ-971); transceiver (MFJ-9420 with microphone); an accessory module, topped by a carrying handle. All interconnecting DC, AF, and RF cabling is in the rear.

The station is capable of producing up to 8 watts CW and 10 watts SSB, and covers the entire 20 meter band in two switched segments. It contains a CW filter with four selectable bandwidths between 750 and 100 Hertz, with no ringing. The center (peak) frequency of the filter is adjustable between 400 and 1,000 hertz, an important plus for those who do not like the usual 750 hertz center frequency. A crystal-controlled marker generator with a 25-kHz output marks the subband edges and maintains calibration of the analog dial. It is controlled from the front panel. An electronic keyer is included, switched on with the filter from the front panel.

It contains a 20-watt 50-ohm dummy load, and a panel mounted RF wattmeter is included. RF from the transceiver can be switched from the input to the antenna tuner, a resonant antenna, or to the dummy load, with a front panel toggle switch. RF power is constantly monitored on this wattmeter. A 1-watt front-firing speaker is included in the power supply, along with both 3.5-mm and 1/4-inch headphone jacks which cut off the speaker when phones are being used. The "icing on the cake" is a 24-hour UTC LCD clock with its own internal battery.

Power Supply and Speaker Module

The power supply uses a standard linear regulator circuit. The transformer has a 16.3-V, 3-A secondary. A 10-ampere bridge is used with a 20,000-μF filter capacitor. Regulation is provided by an LM317T and a single 2N3055 NPN power transistor mounted in a 3" x 4" x 1" flanged heat sink, slightly narrowed with a hacksaw to fit on the rear deck of the Ten-Tec TP-45 aluminum clamshell enclosure. This enclosure is the exact same width as the MFJ cabinets, slightly less in depth and a fraction of an inch higher. A 1-watt, 8-ohm speaker with a large magnet is mounted on the panel, below which are a 3.5-mm and 1/4-inch phone jacks. Also on the panel is a meter which monitors either the DC voltage or current. The meter circuit includes a home-brew 3-ampere shunt, and a zener diode suppresses the meter zero, so the meter indications are from 10 to 15 VDC, and 0-3 amperes. There are two RCA jacks on the rear deck, providing the power for the remaining modules. One of these jacks is a spare and the other allows a 12-volt battery to be plugged in to supply power when commercial power is unavailable.

Antenna Tuner

Although I used an MFJ-971 Portable Antenna Tuner with a twin needle meter to indicate SWR and forward and reflected power, any antenna tuner capable of matching your antenna to the 50-Ohm nominal output of the transceiver can be used. I used a Ten-Tec TP-45 enclosure. (The MFJ-971 tuner is available from AES for $84.)

Transceiver

I used the MFJ-942OX (including the microphone, it was $210 from AES) because it is much more flexible than the other QRP rigs currently available. It's a very well engineered transceiver, originally intended for SSB, but a CW adapter is available which makes it a very fine rig indeed. The receiver is both extremely quiet as well as sensitive. This is a very popular rig. I bought one of the first ones from AES, and it was on back-order for three months. In this circuit the audio output must not be grounded, so you can't mount an external speaker jack on the metal rear deck. A simple modification is to insert a pair of back-to-back 8-ohm to 1,000-ohm tiny Radio Shack audio transformers between the output of the U5 chip and the speaker. One lead of the speaker and of the 8-ohm output winding of the audio transformer can be grounded, with the other lead of the transformer and speaker going to a closed circuit jack which can be mounted at the upper right hand corner of the rear deck (with the front panel facing you). The two transformers can be epoxied to the left side of the chassis at the top, near the rear deck.

Accessory Module

I used another Ten-Tec TP-45 enclosure for the accessories. It contains the RF Wattmeter and switching circuitry, and the dummy load. The dummy load consists of parallel-connected 470- and 560-ohm, 2-watt, 2% metal film resistors, five of each, sandwiched between two pieces of single-sided PC board stock, bolted to the inside of the rear deck. A SPST NO relay, controlled by a toggle switch on the panel, switches the RF from the transceiver to either the RF OUT SO-239 (to

MFJ *tunable* DSP *filter*

NEW

. . . Tunable "brick wall" bandpass, lowpass, highpass, notch, SSB, CW filters . . . programmable pre-set filters . . . automatic multiple notch filter eliminates heterodynes . . . adaptive noise reduction reduces noise and QRN . . . for Voice, CW, Data . . .

MFJ's *tunable* super DSP filter automatically eliminates heterodynes, reduces noise and interference *simultaneously* on SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX, weak signal VHF, EME, satellite -- nearly any mode.

You get MFJ's tunable FIR linear phase filters that minimize ringing, prevent data errors and have "brick wall" filter response with up to 57 dB attenuation just 75 Hz away.

***Only* MFJ gives you 5 *tunable* DSP filters. You can *tune* each lowpass, highpass, notch, and bandpass filter including optimized SSB and CW filters. You can *vary* the bandwidth to pinpoint and eliminate interference.**

***Only* MFJ gives you 5 *factory* pre-set filters and 10 *programmable* pre-set filters that you can customize. Instantly remove QRM with the turn of a switch!**

You get MFJ's *automatic notch* filter that searches for and eliminates *multiple* heterodynes.

You also get MFJ's advanced *adaptive noise reduction*. It silences background noise and QRN so much that SSB signals sound like local FM.

The *automatic* notch and *adaptive* noise reduction can be used with *all* relevant tunable pre-set filters.

***Automatic gain control* (AGC) keeps audio level constant during signal fade.**

Automatic notch filter

MFJ's automatic notch filter searches for and eliminates multiple heterodynes in milli-seconds. It's so fast, that even *interfering* CW and RTTY signals can also be eliminated.

With up to 50 dB attenuation, you'll copy stations otherwise masked by heterodynes.

Voice signals aren't degraded because the notch is extremely narrow.

Turn on *automatic* notch and you'll never hear unwanted heterodynes of tuner-uppers.

You can *selectively* remove unwanted tones using the two *manually tunable* notch filters --an MFJ exclusive. Knock out unwanted CW stations while you're on CW.

Adaptive Noise Reduction

Turning on noise reduction silences background noise. It reduces fatigue and makes noisy signals readable.

Noise reduction works in all filter modes and on all random noise -- white noise, static, impulse, ignition noise, power line noise, hiss.

The LMS algorithm gives you up to 20 dB of noise reduction. Noise reduction is adjustable to prevent signal distortion.

Only MFJ gives you
tunable and programmable "brick wall" DSP filters

MFJ-784B

$\$249^{95}$

Patent pending

MODEL
MFJ-784B
MFJ tunable DSP filter
Filters
Tunable
Pre-Set
Tunable Filters
Noise Reduction
Volume
ON
OFF
AGC
Manual Notch
Auto Notch
Noise Reduction
Speaker
DSP
Power

Tunable highpass/lowpass filters

For Voice and Data, nothing beats MFJ's exclusive *tunable* highpass/lowpass FIR linear phase "brick wall" filters.

You can tune the lower cutoff frequency 200 to 2200 Hz and the upper cutoff frequency 1400 to 3400 Hz. This lets you create *custom* filters for Voice, Data and other modes.

Signals just 75 Hz away literally disappear -- they are reduced 57 dB!

NEW MFJ-784B Features

- Tunable *Spotting Tone*™ -- an *MFJ invention* -- accurately tunes even the narrowest CW filter
- MFJ's exclusive *Adaptive Tuning*™ -- Center frequency tuning automatically becomes finer as you narrow bandwidth -- makes extremely narrow filters easy-to-use
- Improved automatic notch with *variable* aggressiveness
- New quieter audio amplifier gives you *full* 2½ Watts output
- Speaker ON/OFF button, phones always active
- Accurate easy-to-use input level indicator
- *Filter Talk*™ function sends precise filter settings in Morse code
- Filter automatically bypasses during transmit for monitoring CW sidetone, voice or data by sensing PTT line
- Improved manual notch in the CW mode
- Manual notch and automatic notch can be used simultaneously
- Noise reduction,automatic notch and tunable manual notch can be used in Memory mode
- Adjustable line level output
- More Mark-Space frequencies and baud rates for data filters
- Improved self-test for all digital circuitry, switches and controls

Unlike other filters, speech is not distorted by unequal time delay.

When signals are weak, you can improve copy by removing noisy high and low speech frequencies that contain little information.

On crowded HF bands, you can "slice-off" overlapping SSB signals to improve copy.

You can highpass filter out hum, pulses, rasp and other irritating low frequency noise.

Tunable bandpass filters

Narrow band signals like CW and RTTY jump out of QRM when you switch in MFJ's *exclusive* tunable FIR bandpass filters.

You can tune the center frequency from 300 to 3400 Hz, and vary the bandwidth from 30 Hz to 2100 Hz -- from super-tight CW filters to wide razor-sharp Data filters.

As you narrow the bandwidth, interfering signals drop out, because, just 60 Hz away, they're down by over 47 dB.

You can use narrower bandwidths to fight tough QRM because these linear phase filters don't distort signals with unequal time delays.

Even with the narrowest 30 Hz bandwidth, you'll never have a problem with ringing.

One position gives you two tunable filters you can use together. For example, tune one to mark, one to space and set the bandwidth tight for an incredibly sharp RTTY filter.

15 *pre-set* filters -- use factory set or program your own

You can select from fifteen convenient *pre-set* filters. Use them for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any mode you can think of.

If you don't like our pre-set filters, you can program your own -- *an MFJ exclusive!* Save center frequency/ bandwidth, lowpass/highpass cutoffs, auto/manual notch, noise reduction -- all filter settings -- in 10 *programmable* filters.

Only MFJ gives you the best of both worlds -- *tunable* filters to eliminate nearly any QRM and fast convenient *pre-set* filters customized for any mode.

Plus more . . .

A push-button bypasses your filter -- lets you hear the *entire* unfiltered signal.

2½ watt amplifier, volume control, input level control, speaker jack, PTT sense line, line level output. 9½x2½x6 inches.

Plugs between your transceiver or receiver and external speaker or headphones. Use 12 VDC or 110 VAC with MFJ-1315, $14.95.

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MFJ . . . making quality affordable

Front view of the Portable Integrated 20m SSB/CW 2RP Station.

tuner or antenna) or the dummy load. The RF voltage sensing and rectifying components are mounted directly on the RF IN SO-239, and the DC voltage equivalent to the RF power in watts is routed to the panel meter through its calibration multiplier trimpot. A red LED, in series with the 2.7K-resistor, indicates when RF is routed to the dummy load. The LED draws about 4.5 mA, yet is quite bright.

Crystal Marker Generator

Probably most of you have a crystal marker generator, as I do. However, I constructed one specifically for this station on a Radio Shack 276-150 general purpose PC board. The oscillator is a 74LS00 with a surplus 5 MHz crystal, divided by five in a 74LS90 to 1 MHz, then by ten in another 74LS90 to 100 kHz. This is divided by four, to 25 kHz, in a 74LS74, and an insulated wire from pin 5 is wound one turn around the insulated wire between the RF switching relay, mentioned above, and the dummy load. It is preferable when using the crystal marker to switch to the dummy load so the only signals you will hear will be at 25 kHz intervals. A green LED is controlled by the generator's on-off switch.

Electronic Keyer

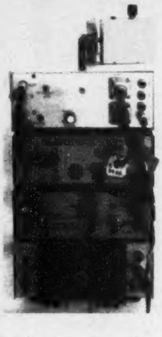
Most of you who are using CW have and use electronic keyers, and any keyer can be used. The one I use is a "poor man's keyer," designed by AB4DP in 1989. It does what it is supposed to do, and at very low cost. Built on a Radio Shack 276-150 PC board, it contains six TTL chips of the LS family to hold current down, and a 5-volt regulator. The speed control pot is mounted on the rear deck because it will seldom need adjusting. It is turned on and off by the same panel switch as the AF Filter, with a yellow LED indicator.

CW Filter

Although I much prefer to copy a low (400 to 500 Hz) CW note, I was almost ready to install a 750-Hz filter I had constructed using one of W1FB's designs when I glanced at a new Ramsey Electronics catalog. Their new Model AF-1 filter uses a pair of MR8 switched capacitor filter chips, incorporates an LM380 amplifier to bring up those weak CW signals from the noise, has four selectable bandwidths (750, 500, 250, and 100 Hz) plus an adjustable center (peak) frequency. I would not have to listen to 750-Hz tones; I could pick my own lower frequency note. The cost, in kit form, is $36 plus the usual S&H. This filter also contains a limiter circuit at the input so it cannot be overloaded with too high a signal from the speaker jack. Because Ramsey intends this filter to be a self-contained item, it uses a bridge circuit so it can be operated from 12 VAC or 12 VDC without regard to polarity. It also contains board-mounted RCA jacks for audio input and output. Three DPDT push button switches, also board-mounted, provide on/off power and filter bypass on one switch. The other two switches must be manipulated in a relatively complex in/out system to select the desired bandpass. The CW gain pot is board-mounted. So is the pot which adjusts the center peak frequency. Because I intended to install this filter in the accessory module and use 3.5-mm phone jacks for audio in and out on the rear panel, and also because room in the accessory module was rapidly diminishing, I mounted the keyer where the filter would have to fit. I took my trusty hacksaw and removed the rear section of the PC board, eliminating the power bridge and RCA jacks. Also, I have an aversion to board-mounted controls, so I did not use those supplied. I used a DPDT toggle switch to control power and to bypass the filter, and two sections of a 4-position wafer switch to select the four bandwidths. I mounted a standard 10k pot on the panel for CW gain, and installed a rectangular multiturn trimpot replacing the pot which selects the center peak frequency, which I set for 500 Hertz.

Operation

Although my antenna, 33 feet of sloping wire at an average height of ten feet, is hardly state of the art, it's the best I can manage in my location, so I didn't have too high a hope for results. Tuned up, I can produce 5 watts CW and 8 watts PEP on SSB. I have tried it on SSB because my average power is probably no more than 3 watts which, combined with a much less than optimum antenna, should be a severe handicap. If I could talk with anyone I would consider myself lucky. The first five QSOs with this new station really surprised me! Even though conditions were very poor, W3FPN in Florida gave me a 4 by 0. He was 5 by 1-5. The next day PA0EWE, who was only coming through 5 by 1, gave me a 5 by 1-4. We had a 10-minute chat, and he was running 400 watts to a beam. Okay, *he* was doing most of the work. AA2NU (NY), who was only 5/4, gave me a 2/2. W1KY (NY) was 5/8 and gave me a 5/6 and a note on his QSL that mine was the best QRP signal he'd ever heard. How about GD0PLT on the Isle of Man (in a pileup!), he was 5-5 gave me a 5/1-2. He was running 400 watts and a 2-el triband beam. Obviously, much praise should go to MFJ and the engineers who designed the MFJ-9420. The Ramsey AF-1 filter is phenomenal. Listening on CW, I was able to pick out a weak signal down in the noise and gradually hoist it up until it was all alone in the center of the 100 Hz passband, with absolutely no ringing. I wouldn't have believed it until I actually tried it.



Rear view of the Portable Integrated 20m SSB/CW 2RP Station.

What Does It Cost?

Although the main components: MFJ-942OX and MFJ-971 total $294 (from AES). Then, other than the $36 for the AF-1 filter kit, I delved deeply and often into my junk box. Therefore. I spent quite a bit less than if I'd purchased all new or surplus parts. To give you an idea of total cost to duplicate this station I have gone through my catalogs to get the latest prices. The power supply and speaker: $51.25. CW filter: $42. crystal marker: $9. RF wattmeter and dummy load: $16.50. Electronic keyer: $11. Two TP-45 clamshells: $25. Handle: 50¢.

Conclusion

This article was written not for you to duplicate my particular station, but to suggest an approach which you might wish to emulate, using whatever rigs and accessories you have on hand. Look for me on 20 meters from Puerto Rico, both CW and SSB. I may not bend the needle of your S-meter, but I can give you a fine Q5 signal!

Have Beam, Will Travel!

Shake, twist—your walking stick becomes a beam!

How would you like a four element 2 meter yagi that travels the mountain trails as as walking stick? Pick a rest stop, remove the end cap, shake out the elements and feedline, and in two minutes your HT is full quieting wherever you point it.

Finished resting? Unscrew the elements and drop them into the boom; you're ready for travel. But whenever you get the urge, it's there, ready to zero in on a jammer, chase a radio fox, or shoot your signal out of a hole in time of difficulty.

What is it? ArrowBeam. It shoots straight and true, and its strong flexible elements are stored in the boom like arrows in a quiver. It weights only a pound and a half and is balanced in the hand, but it can take abuse.

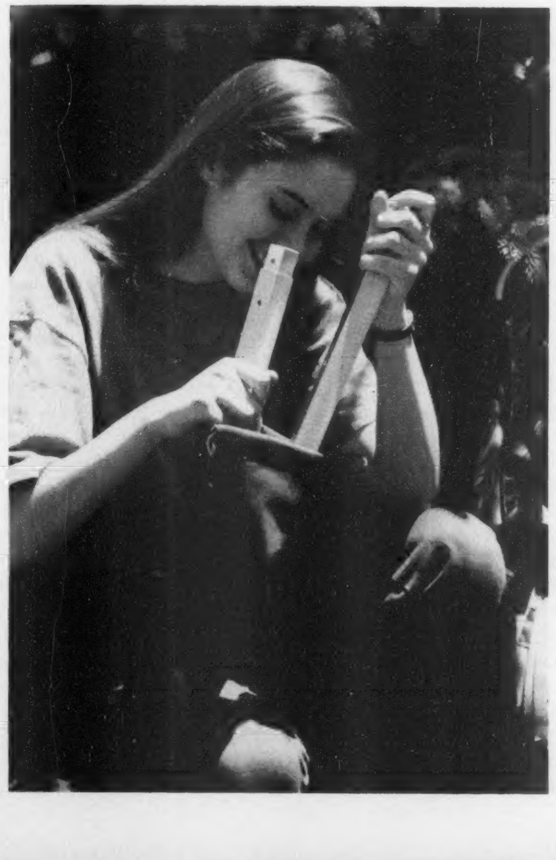
Keep it in the trunk of the car. It's tough exterior protects everything against damage as it gets tossed and knocked about. But when it's time for action—shake, twist, and ArrowBeam is ready to shoot your RF right where you want it.

This handy versatile antenna is made to be dropped, bumped, and stepped on while you are racing through brush and branches in pursuit of the elusive radio fox. Drop it? It bounces. Snag a low limb as you drive by? Twang! the tempered elements just spring back into position. Sit on it? You'll need a bandaid for your fanny, but ArrowBeam will be ready for more.

Of course ArrowBeam will do just fine in an attic or on a mast even though it's made for the torture of the T-hunt.

Performance? ArrowBeam scored best for its boom length at the Dayton VHF competition. It's the antenna chosed by the FAA for its spook beacon and rogue ELT search teams.

Now you can have ArrowBeam's performance and toughness for your radio adventures.



Half-Size ArrowBeam? Now there's a version of ArrowBeam that breaks down to half the Walking Stick size—the Grab-N-Go Arrow Beam. For storage the boom separates at the center, so the whole antenna stores in half the length—perfect for slipping in a backpack.

You get the same great performance, the same ease of assembly, the same robust durability, but Grab-N-Go fits in your suitcase.

The Grab-N-Go ArrowBeam comes in its own forest green stuff sack. There's extra room there for other goodies you may wish to carry with your beam—feedline, homebrew PVC mast, omnidirectional Pico-J antenna, etc. This is the version Becca is taking on her trip.

ArrowBeams

- **Walking Stick 2m $79**
  Elements 4 Boom Length 48"
  Gain 6.1 dB Front/Back 10.1 dB
  SWR <1.1 min, <1.5 band edges
  Add $6 S&H
- **Grab-N-Go 2m $89**
  Same as above, but breaks down to <25" for storage. Mast mount and Forest Green Stuff Sack included. *Add $6 S&H*
- **Walking Stick 70cm $49**
  Elements 5 Boom Length 40"
  Gain 7.3 dB Front/Back 12.1 dB
  SWR <1.1 min,<1.5 band edges
  Add $5 S&H

Other Range Extenders

• Pico-J 2m	$19.95 ppd
• Pico-J 2m/70cm	$26 ppd
• 2m Packet Pico-J	$22 ppd
• TigerTail (2m/70cm)	$8 ppd

Save $5

Order more than one item and knock $5 and shipping off the price of each after the first.

☐ **Yes. Send ArrowBeam:** ☐WS2m ☐WS70cm ☐GnG 2m
Yes. Send my ☐ **Pico-J** Model:.......... ☐**TigerTail**

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Nostalgia For The Future

High performance crystal radio utilizes a high-efficiency JFET detector and dual resonant circuits for superior performance.

by David W. Cripe KC3ZQ

Abstract: This article describes a high-performance crystal radio receiver utilizing a hign-efficiency JFET detector, and a dual-resonator tuned circuit for high selectivity. Included are a parts list, plans, and photographs showing construction details.

Ultimate Crystal Receiver

In our age of satellites, Digital Signal Processing, and packet radio, why would anyone give a second thought to a technology that was obsolete by the vacuum tube? Even though the crystal radio has been with us since the earliest days of the radio hobby, there are still thousands of enthusiasts who have a fascination for the lowly crystal receiver. There are thousands of hams who received their introduction into radio through little, home-brew crystal receivers, and to us, these conglomerations of wire, headphones and cat whiskers hold a special nostalgic attachment.

Having gotten my start in radio some twenty-five years ago with a little crystal set, I never really stopped playing with them, having built perhaps a dozen or so over the years, testing out one idea or another. Recently, I decided to design and build the ultimate crystal receiver. I spent a couple months here and there experimenting with various tuning configurations, and detector circuits, arriving finally at a design capable of pulling in some real DX. I found that with the proper design and a good antenna, a crystal radio is capable of performance equal to that of a typical portable transistorized receiver, and is much more fun to build and operate!

How It Works

Since a crystal radio has no amplification, it is essential that as much as possible of the energy entering the antenna be converted to audio energy in the headphones. Consequently, each of the components of the receiver must operate with very little signal loss. See Figure 1, the schematic of the new-and-improved crystal radio. Unlike the crystal sets that most of us are familiar with, this one uses two coils, L1 and L2, each with its own variable capacitor. The coils and capacitors in a crystal radio form a tunable band-pass filter with which the desired signal can be selected, and the unwanted signals rejected. These two resonant circuits form a two-pole band-pass filter giving much higher selectivity than that attainable with a single circuit. Dual resonant circuits are nothing new in crystal sets; the idea has been around since the days of spark. But, the additional selectivity the technique affords is especially useful in separating signals in today's crowded AM band. Additionally, coil L1 has a sliding tap to match the antenna impedance to the rest of the circuit; similarly coil L2 has a sliding tap to match the impedance of the detector and headphones. Figure 2 is a detailed close-up of the coils.

The purpose of the detector in a crystal radio is to convert the amplitude- modulated radio-frequency signal to an audio signal. It does this by clipping off the negative half-wave of each RF cycle, yielding a signal containing an audio- frequency term. The most radical departure of this receiver from conventional crystal radio design lies in the design of the RF detector. The detection efficiency of the 1N34 germanium crystal diode used as the detector in most crystal receivers diminishes rapidly if the peak amplitude of the RF signal applied to it drops below 0.3 volts. Consequently, in this design, the crystal diode detector has been discarded in favor of a circuit utilizing a Junction-Field-Effect-Transistor having superior detection efficiency and weak-signal performance than that attainable with a diode detector.

The detector used here is comprised of the circuit containing Q1, C3, R1, R2 and B1. The drain of the JFET Q1 is connected to the sliding tap of L2, and the source terminal of Q1 is connected to the headphones. The gate terminal of Q1 is coupled to the 'hot' end of L2 through C3. The drain-source channel of a JFET acts as a variable resistance, controlled by the voltage applied to the transistor gate. Since the 'hot' end of L2 has a much larger RF voltage amplitude than is present on the tap for the drain of Q1, we can take advantage of this voltage gain to cause Q1 to transition cleanly between a high-resistance and low-resistance state. This makes it a very effective RF detector, one requiring no external power source! (Note: You may want to experiment to see just how effective the JFET detector is—temporarily remove the circuit, and replace it with a 1N34 between the L2 slider and the phones. Quite a difference!)

Notice that there is a battery in the circuit—usually forbidden in crystal radios! This battery is NOT used as a power source for amplification, but as a voltage source, which, with resistors R1 and R2, is used for setting the bias voltage on the gate of Q1 for maximum sensitivity. (It is interesting to note that bias voltages were sometimes applied to the crystal detectors of early crystal radios, for the same purpose.) When operating, the current draw from this battery is only 9 µA, so even under daily use, this battery should last for several years. Because of this low current draw, this circuit will work fine using old batteries too weak to run your Walkman.

Building The Radio

Unlike most electronic construction projects, a crystal radio requires one to be a bit of a handyman to put one together. You will need some wood-and-metalworking tools in addition to a soldering iron to build this project. Furthermore, some of the parts for the radio will take a bit of hunting to find. High-impedance headphones, variable capacitors, and Fahnestock clips are definitely not stocked at your local Radio Shack! If your junk box doesn't have these parts, they are available through mail order. While you are waiting for these parts to come in, you can be winding coils!

The coils L1 and L2 are approximately 250 µH each, and are designed for very high Q and low distributed capacitance. The coils are wound with 16 gauge enameled magnet wire with each turn spaced by roughly one wire diameter. The coils L1 and L2 must be wound on coil forms approximately 4" diameter by 7" long. Cornmeal is sold in cardboard boxes of this size. In my case, I happened to have some sections of thin-wall PVC drainage pipe of these dimensions which worked well, also. Drill the holes for mounting the slider bar and winding termination points as per Figure 3. If you are using cardboard coil forms, spray them with several coats of clear Krylon™ varnish before winding. Obtain 1-1/2 lb. (175 feet) of 16 gauge enameled magnet wire, which can be purchased at your local electric motor repair shop. You will also need a spool of cord or twine of approximately the same diameter as the wire to space the turns. Wind the wire and twine on the form at the same time, so that the wire and twine goes on in alternate turns. Start and finish winding leaving approximately 1/2 inch on each end of the coil form (65 to 70 turns). Loop the wire through the termination holes drilled in the coil form, and tie the twine off so it does not unwind from the coil form.

Next, spray the wound coil with a layer of Krylon™. When this is dry, unwind the twine, being careful not to dislodge the spacing of the turns of wire. Give the coil one more good coat of Krylon™ to fix the spaced turns of wire in place.

Install the winding terminal hardware as shown in Figure 4. Cut the ends of the coil windings about 1/2" longer than needed to reach these screws, and sand off the enamel insulation prior to assembling this hardware. Wrap the wire around the screw prior to installing the Fahnestock clip on the terminal screw.

It is necessary to remove the wire's enamel insulation from the section of the coils beneath the slider's path. Using an emery fingernail file, sand the insulation from the wire in a 1/2" wide strip beneath where the slider will mount. Brush the copper dust away so that no shorts result.

The slider assemblies are used to obtain the adjustable taps on the coils L1 and L2. The sliders will require some care in their fabrication. Figure 2 and Figure 4 show details of their construction. First, build the slider bars. Take the 3/16" square brass tubing, and cut them to the length of the coil forms. Then, drill a 1/8" diameter hole through the tubes 1/4" from each end. File down the burrs from these holes so that the 7/32" tubing can fit over the 3/16" tubing. The slider is constructed by cutting a 7/16" long section from the 7/32" square brass tubing. Carefully de-burr the cut end, and make sure that the 3/16" square tube will slide smoothly inside it. Solder the head of one of the 1/2," 6-32 flat head screws to the middle of one side of the piece of 7/32" tubing. Next, obtain a ball-point pen spring from which to form the slider contacts. (Note: the brass or copper colored springs will solder more readily than the unplated steel springs.) Straighten out the spring, and cut two, one inch lengths. Bend these pieces of wire into 'U' shaped loops, and solder these onto the sides of the sliders, so that about 3/16" of the loop extends below the slider tube. An alternative approach to the slider contact construction can be had if you have access to a section of copper fingerstock. A single finger may be cut off and soldered onto the square tubing for a ready made slider. Screw a wire-nut over the 6-32 screw on the top of the slider for an insulated handle. Slide the slider assembly over the 3/16" square slider bar, and mount the finished assembly on the coil form as shown in Figure 4. Space the slider bar up from the coil form with #4 washers so that the spring wire slider contact just grazes the wire of the coil. (Note: if you chose not to fabricate your own slider assemblies, they are available pre-made from Modern Radio Labs.)

Now, cut a 22" length of a 1" x 12" board on which to mount the whole assembly. This is the origin of the term 'breadboard'—old-time radios used to be built on wooden bases! From the wood remaining, cut two 4" by 6" pieces, and drill two 3/8" holes in each as shown in the diagram. Cut the 3/8" diameter dowel rods to a length of 24 inches, and insert the two pieces into the holes in the 4" x 6" blocks. Use a couple of finishing nails to affix these blocks onto the ends of the breadboard base. This forms the cradle which will hold the coils, and allow the distance between them to be varied.

As far as the assembly of the JFET detector circuit is concerned, construction is not critical. You may wire it up point-to-point, as I did, on brass brads driven into the breadboard. It may look pretty ratty, but fits in well with the overall aesthetics of the project.

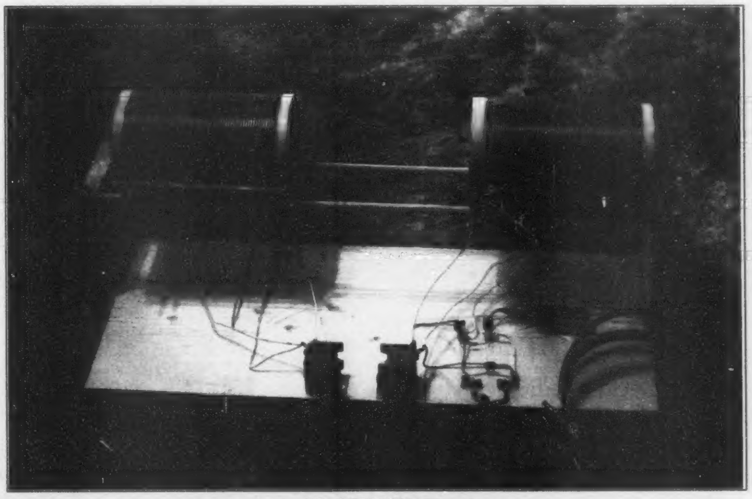
Notes On Parts

Undoubtedly, obtaining the parts to build this project will take more legwork than most of us are accustomed to. Unless you have a junk box as extensive as mine, you will likely have to hit some hamfests, or wait a few weeks for mail-order parts to arrive. But, be assured, that the thrill of operating this little receiver will make up for the time and effort that went into building it.

To obtain the square brass tubing needed for the coil sliders, try your local hardware store or hobby shop. Stores specializing in model airplanes, or radio controlled cars are likely to carry assorted brass tubing.

The variable capacitors C1 and C2 are standard 365 pF air variables. In recent years, these have become more difficult to find, but they are still available with a little searching. Antique Electronic Supply, Modern Radio Labs, and Fair Radio are good sources. If you don't have any lurking in your junk box, and don't want to go the expense of new units, I recommend you hit the local garage sales, and pick up a couple old tube-type, counter-top radios. These can usually be found for less than a buck, and are full of good salvageable parts for experimenters—in addition to variable capacitors.

The antenna for this radio is particularly important. The energy which



Assembled KC3ZQ Receiver

makes it to the headphones has to come into the antenna first, so if you want to go for DX, don't scrimp on the antenna. The general rule of thumb is to use as much wire as you can, and put it as high in the air as possible. If you are using a wire dipole for HF, a good AM broadcast antenna can be had by tying the center conductor and shield of the dipole feedline together to make the feedline a vertical antenna. Similarly, if you have a roof-mounted TV antenna, tie the ends of the 300 ohm twin-lead together to use the feedline as an antenna. The ARRL Handbook might provide ideas for antennas, but—use your imagination and creativity.

A good ground is equally important! But, most hams already have their shacks well-grounded, so this should not be a big problem.

Headphones are another area where good equipment makes a real difference in the performance of a crystal radio. A good set of 2000 ohm, high impedance headphones is essential. These can often be found in hamfests in used condition at quite reasonable prices—otherwise, Fair Radio, Modern Radio Labs, and Antique Electronic Supply each carry them. If at all possible, try to acquire a set of phones manufactured by Baldwin. These used a mica diaphragm rather than the steel diaphragm that most high-impedance phones had. They have a very well deserved reputation for sensitivity, and are worth the extra couple bucks you will have to pay for them.

You may also wish to experiment with a crystal earphone instead of the 2000 ohm headphones. These are less expensive than a new pair of 2000 ohm phones, and are roughly as sensitive. Crystal earphones are available from Mouser Electronics, Antique Electronic Supply, and Modern Radio Labs.

Fahnestock clips are the final touch needed to complete the project. Although they are not necessary electrically, they are a convenient way to hook up the circuit, and they do add a nostalgic touch to the project. They are available from Antique Electronic Supply and Modern Radio Labs.

Operating The Receiver

Once the receiver is assembled, and antenna and ground wires connected, it is time to give this rig a listen! Start off by setting the adjustments to nominal settings. Slide coils L1 and L2 so that their adjacent ends are about 4" apart, and set the sliders of each to about one-half of the way up from the grounded end of their respective coils. In adjusting the sliders, it is necessary to be careful that the slider contact touch only a single turn on the coil. If the slider is positioned so as to short two turns together, it will greatly reduce the sensitivity of the receiver. Set R2 to the middle of its range. Then, listening on the phones, turn C1 and C2 together until a strong, local station is heard. You may hear more than one station in the background. The detector bias voltage setting is particularly critical, so carefully adjust the detector bias control, R2, until the receiver volume is maximized.

I have found for this design, the best compromise of sensitivity and selectivity occurs when the adjacent ends of L1 and L2 are separated by about six inches. The selectivity of the receiver is also increased by adjusting the sliders toward the grounded end of their coils. For a long antenna, the best performance will be had with the L1 slider only a few turns from the grounded end of the coil. When increasing the selectivity of the receiver, there will be a point past which the volume of the signal will begin to diminish. It is at this point that the receiver will perform best. If you have access to a millivolt-voltmeter, it can be used to quickly find the optimum settings for the sliders. With the receiver tuned to a strong local station, by repositioning the sliders one way or another, and re-peaking the tuning capacitors, it is possible to find the position of the sliders giving the maximum detected carrier voltage across the headphones, which will be the most sensitive setting for the receiver.

So how does it work? Perhaps my station log might be some indicator of the performance of this rig. Using a 40 meter dipole at 30 feet as my receiving antenna, I was able to pick up KAAY, KOA, WSM, WMAQ, WSB, WBAP, WLW, WWWE, and a score of other mid-western clear-channel stations. Selectivity was such that I could easily separate KAAY (1090 kHz) from KHMO (1070 kHz). It is quite a novel experience to hear 'DX' on a crystal radio that one can't even hear on a more expensive transistor portable.

While I can say that my most memorable radio experience was listening to my first crystal radio, the fun of building and operating this latest one must come in a close second. I hope that anyone else who chooses to build one of these derives as much enjoyment from it as I did mine. And perhaps with it, you may inspire an inquisitive youngster into a lifelong love of radio, with a crystal set that will be nostalgia for the future.

Parts List:

C1, C2	365 pF Air Variable Capacitors	
C3	100 pF SM or Ceramic	RS# 272-123
C4	0.01 µF RS# 272-131	
R1	1 MΩ, 1/4 W	RS# 271-1356
R2	1 MΩ, Variable	RS# 271-211
L1, L2	250 µH tapped inductors—see text	
Q1	2N3819 JFET	RS# 276-2035
B1	9V battery	
	9v battery clip	RS# 270-325

Qty	
1-1/2 lb	16 AWG. Enameled Magnet Wire
2	3/16" x 12" square brass tubing
1	7/32" x 12" square brass tubing
2	1/2" x 6-32 brass flat-head screw
4	5/8" x 6-32 brass round-head screw
4	5/8" x 4-40 brass round-head screw
10	Fahnestock Clips
	#6 x 1/2" Sheet Metal Screws
	#6 brass flat washers
	#4 brass flat washers
	#6 bronze split-ring lock washers
	#4 bronze split-ring lock washers
2	Small wire nuts
2	Knobs for C1 and C2
2	3/8" x 3' wood dowels
1	1" x 8" or 1" x 12" board—at least 28" long
1	Spray can clear Krylon™ varnish
2	Coils Forms—see text

Suppliers:

Antique Electronic Supply 6221 S. Maple Ave., Tempe, AZ 85283

Fair Radio Sales 1016 E. Eureka Box 1105, Lima, OH 45802

Modern Radio Labs (My favorite source for hard-to-find crystal set parts) P.O. Box 14902, Minneapolis, MN 55414 Catalog $1

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A Perspirational Message

by Wayne Green W2NSD/1 Editor

In my urging you to get up off the couch and make things happen, I often point out that hey, if I can do this, why not you? Some readers take this to heart and take up my challenge. Others just tell themselves that this is just Wayne bragging again. No, my ego is doing fine, it's yours I'm worried about.

The fact is that with very few limitations, you can do anything you really want to. My challenge is to get you to want to badly enough to get you to turn off the TV and then climb off the sofa. Yes, you can become an expert on digital electronics, if you want to. You can become a world-class expert on cold fusion. Or perhaps you'd like to become an expert horseman or race car driver? All it takes in the will to do it, which is an internal drive to succeed that I can't do anything about. You *can* stop smoking. You *can* lose weight, thereby adding years to your life.

I am an expert horseman, but I didn't do anything that you couldn't have done. It was a few years ago. I'd signed up to take a course in advertising put on by the Advertising Club of New York. That course has been invaluable for me. They should put that out on video. For some reason the members of the class decided to go horseback riding in Prospect Park, Brooklyn one Saturday. I'd taken horseback riding lessons when I was 11, but hadn't ridden much since, so I went with the group and had a great time.

I decided to get better at it, so I started taking lessons. Once a week I put on my riding britches and boots and took an hour lesson from an excellent instructor. I got to be pretty good. Then I got to be very good. So I bought an Arabian gelding and trained him so that I could ride without a bridle and he would stop, turn, go into any gait, back up and so on, all with imperceptible leg signals. Pretty soon I was teaching other riding instructors.

When I visited the radio station where I used to work in Sarasota (FL), I naturally went riding, renting a horse from the Ringling stable. When they saw I knew what I was doing they let me ride their star show horse, Starlit Night. That was fun for me, and needed exercise for the horse. If you let a poor rider ride a well-trained horse, it quickly untrains the horse.

You can get good at anything you want to the same way I did, through determination and perseverance. That's the same way I got good at race car driving. I took lessons from the Porsche professional racing drivers and I raced on some famous race courses (such as the incredible Nürburgring and the Solitude race track) in Germany. When I wanted to learn to ski I took some lessons locally to get started, then I went to Aspen and took lessons from one of the world's best ski instructors. Within a week I was skiing better than I ever thought I could. I was tearing down the expert trails, ready for anything.

When I wanted to get good at Chinese cooking I took lessons. Soon I was turning out spring rolls that were better than I could find in Chinese restaurants. And my spare ribs with black bean sauce on soft noodles was wickedly good. Every bit as good as anything Hong Fat on Mott Street was serving.

Any skill you want to build is going to take hard work. Physical skills mean finding good teachers and then keeping at it until you've built the coordination that lets you excel. Developing your mental skills usually means finding your teachers via books, since this gives you access to the best in the world, and not just those in your area.

It's fear of failure which has kept so many older people away from computers. So what's been keeping you from getting involved with packet? It's certainly not the expense, which is modest. There's bound to be at least one ham in your area who's active on packet. Find him and get him to teach you. Once you've gotten going you can read more and then start talking with the experts in the field. This is where your *73* back issue collection will be priceless for you. The next thing you know you'll be an expert and working on ways to take the newer developments for the Internet and apply them to ham radio communications.

Anything they can do on the Internet we should be able to do on 20m, including ATV and duplex voice communications. It's we hams who should have been doing this pioneering, but we dropped the ball 30 years ago, so now we can at least apply technologies developed for other systems to amateur radio. Yes, if you want to, you can become an expert and pioneer on 20m ATV. I mean *you*, so stop looking around furtively.

The only things we fear in life are those we don't understand, if you think about it. Once we understand things we may respect them and be careful, but we'll no longer be afraid. I respect sharks, but I'm not the slightest bit afraid of them. So I'm careful when I'm swimming with sharks. It's only our ignorance which makes us afraid, and that's completely self-inflicted.

I'm very careful of high voltage. I learned that the hard way in 1938 when I was thrown across the room one night when I did something stupid. I survived (obviously), but I learned from the experience and it hasn't happened again.

You've been missing out on tons of fun via the ham satellites. Fear? It certainly isn't because it costs a lot of money, so it's got to be fear or laziness. Oh, you're too busy? Sure, I believe you. Well, I would, except that I notice that somehow you do manage to spend time on the things you really want to, so we're not talking time, which is a very lame excuse, we're talking motivation. Which is why I'm after you, month after month, to shake loose and restructure your life so you'll be able to build your physical and mental skills. And, via amateur radio, you'll be able to get to be an expert in fields which are in serious demand right now, and will be even more in the future.

Or perhaps you'd like to be king of the hill in DX? That's going to cost a bundle in both equipment and time, but the fact is that you can be a top DXer if you decide it is important to you. That means you need a good location with some room for beams and not many neighbors to beef about TV interference or sue over your ugly tower. It means at least a 70-foot tower, some monoband beams, and a kilowatt (minimum) amplifier. It also means you've got to build some skills. Signal alone will leave the mustard completely uncut. Or you can sit there with 100-watts and unlimited determination and collect just about every certificate ever issued, the way Howie W2QHH has for years. He could paper the Pentagon with his collection.

As Ray Croc, the man behind McDonald's, put it when he was writing about success, it doesn't take brains — there are too many brilliant scientists who can't afford a new car. It doesn't take education — look at the number of impoverished college professors. All it really takes is perseverance and you can have just about anything you desire. Do I have to sing "When You Wish Upon A Star" to get you motivated? "When you wish upon a star, makes no difference who you are, anything your heart desires can come to you. If your heart is in your dream, no request is too extreme. When you wish upon a star, your dreams come true." But you do have to back up your dream with plenty of hard work. Nothing is free that's worthwhile.

Health, wealth, happiness, and endless fun with amateur radio are all waiting, but not for the unmotivated. It's your decision. You can build skills and knowledge, or you can go watch ball games, swill beer, smoke, and waste hours a day numbing your mind with think-free TV garbage. It's your deal, so pick up the cards and let's see what your future holds.

Number18 on your Feedback card

Jan Mayen—A Special DXCC Country

by Roald Steen AJ0N/LA6US

The island of Jan Mayen is a volcanic island administered by Norway and located northeast of Iceland and about 300 miles off the coast of Greenland. Jan Mayen has become a special DXCC country with the prefix JW. Norwegian radio operators who operate from Jan Mayen use their Norwegian call, but replace the prefix LA with the prefix JW for Jan Mayen.

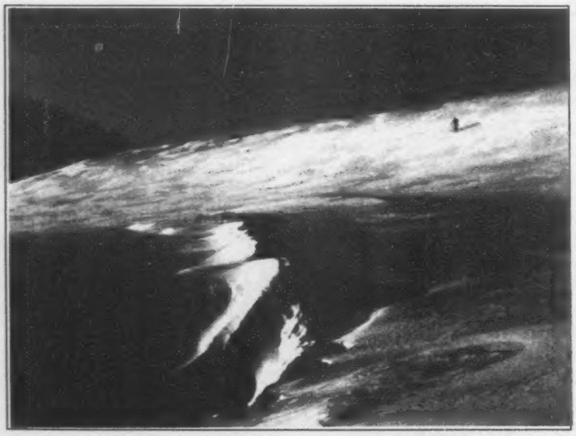
Jan Mayen is not a rare DX country, despite the small number of personnel on the island—usually less than 50—since many members of the island staff are engineers or technicians. One or more hams are active on the island much of the time.

I have worked Jan Mayen a few times on 20 meters from my home in Minnesota. I have also heard the island on the air during some of the Scantests (The Scandinavian Activities Test) which I have participated in, without being able to break through the resulting pileup.

The dormant volcano of Mount Beerenberg is the dominating feature of Jan Mayen. The peak of Mount Beerenberg, located on the Northeast end of the elongated island, rises to an altitude of 2543 meters (8347 feet). Glaciers cover much of the mountain. At several points, the glacier covers the mountain all the way down to the ocean.

JAN MAYENSFIELD
AIRPORT

The weather of Jan Mayen does not make the island an attractive destination for your next vacation. Most of the year, the island is covered by clouds and fog. Strong winds are frequent. These strong winds quickly blow away much of the snow that falls on Mount Beerenberg. Much of the outer surface of Mount Beerenberg therefore consists of ice instead of snow.



While the weather on Jan Mayen is not very hospitable, it is of great interest to weather forecasters. Observations from this island play an important role in European weather forecasts. A U.S. Weather Station operated from Jan Mayen for a few years beginning during the Second World War.

The staff of Jan Mayen consists of a small crew of Norwegian armed forces personnel, together with employees of the Norwegian weather service. They operate satellite communications and two way radio communications for shipping and air traffic control for aircraft overflying nearby airspace. The island's Loran C transmitter operates as part of a radio navigation system managed by the U.S. Coast Guard. The Loran C transmitter on Jan Mayen makes it possible to navigate across much of the North Atlantic Ocean.

The island facility includes a small ham shack, separate from the other buildings. There's a story about the time when a polar bear began to show a great deal of interest in the ham shack while the ham radio operator in it had forgotten to bring his rifle. He had to ask a ham in Norway over the radio to contact the appropriate Norwegian authorities. They contacted the island staff, informing them about the problem. They sent out a small "rescue mission" that used gunfire to chase the bear away.

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73 Review

Number 20 on your Feedback card

by Gordon West WB6NOA

Alinco DX-70 HF/6mTransceiver

Surprises Everyone

Alinco Electronics, based out of Torrance, California, is best known for their single- and dual-band VHF/UHF handheld and mobile transceiver equipment, which is being sold by over 80 amateur radio dealers throughout the United States. Certain Alinco radios have achieved "fan club" status because of their unique design and relatively low cost.

For instance, there's the Alinco 1200TH2 9600 baud packet radio made popular by Buck Rogers packet column, the Alinco DJ-G1T first handheld ever with spectral channel-occupancy bar graph, and the Alinco DR-599 dual-band mobile with "secret" antenna jack for public safety 800-950 MHz.

While Alinco Electronics, Inc., does not enjoy the market share of Kenwood, Yaesu, and ICOM, the company does enjoy a reputation for good performing VHF/UHF equipment at prices slightly lower than the big three, and a small but efficient service team who can turn around most repairs at the Torrance, California, facility within ten working days. Alinco's technician/engineer, Taka Nakayama AB6VE, is extremely active on the ham bands and knows the equipment inside and out. "I love operating ham radio," comments Taka. "When it comes to 9600 baud packet, cross-band duplexing, or driving in downtown areas where intermodulation is a problem, I know how well our Alinco radios work because I'm active on the air," smiles Nakayama, who holds an Extra class US license and a Japanese license, too.

But Alinco Electronics really surprised the amateur radio community by coming out with a high frequency transceiver for the 1995 Dayton HamVention debut. "First we have VHF/UHF, and now we have high frequency, too," comments Alinco Electronics USA President Mark Morisato, KC6OCX. "And our new high frequency DX-70 does more!" adds Morisato. No doubt Mark means the built-in, all-mode, 6-meter, 50-54 MHz transceiver with 10 watts output that is included in the unit which is the same size as the popular Kenwood TS-50 mobile HF transceiver.

The new Alinco DX-70T HF plus 50 MHz all-mode transceiver runs 100 watts out from 1.8 MHz to 28 MHz on the ham bands, and tunes 150 kHz to 30 MHz continuously with its excellent general coverage receiver. Plus it covers 50-54 MHz, with all modes and 10 watts out. That's plenty of soup to kick a 6-meter power amplifier into "QRO."

Most unique is the detachable control head that allows the new Alinco DX-70T to be separated so the head can go on the dash, with the transceiver under the seat. The mike still plugs into the transceiver body, so separating the two can't be a trunk-and-dash affair. But I don't recommend trunk mounting of a remote-controlled transceiver anyway because of the long run of the DC power cable. This is just asking for trouble. If you need a longer mike cord they have an EDS-5 microphone extension cable that will handle the job nicely. Keep in mind that the extension cable will cost extra—probably about $40—so if you plan to run it remote, factor this in to the transceiver's street price, which will probably run around $1,250.

Yes, 6-meter fans, of course there's a separate output SO-239 antenna jack. When you switch to the 6-meter mode you can hear several relays go clink, telling you they are running an independent receiver and transmitter section for best performance on the 6-meter band.

I hooked the DX-70 to a 3-element tribander and regulated 12-volt power source, with the 6-meter side on a 3-element beam to see how the new radio would perform in the real world. The display popped up with a bold numerical readout of frequency: MHz, kHz, and hundredths. The numbers are slightly smaller than the Kenwood TS-50, but are bolder—fatter—darker. And like the Kenwood TS-50, there is a "busy" icon when the squelch is open, along with an amber LED that also lights up with receive activity. The mode indicator appears in the upper right-hand corner, the AGC fast or slow appears above the frequency display. The VFO for memory channel shows to the left of the frequency. And more than enough audio to drive the top-mounted speaker.

As soon as I hooked into the tribander there was no mistaking that the Alinco DX-70 had a great receiver. It is dual-conversion, with sensitivity and selectivity numbers identical to what you might find on everyone's sales brochures for a $1,000 HF mobile SSB transceiver. But unique with the Alinco DX-70 is the bottom left RF button that lets you switch in the 10 dB pre-amp, switch it out, or switch in -10 dB and -20 dB attenuation. I found that the attenuator was a big help when operating on 40 meters with a neighbor one block away just 75 kHz up the band. On 10 and 15 meters I switched the pre-amp on which gave me a hot receiver.

The same button that controls the RF gain selection also has a sub-function, turning the noise blanker on and off. While the noise blanker does not have any timing or sensitivity adjustments, it did a nice job of killing the clatter of our next door neighbor's old Ford Thunderbird when he fired up the engine. The noise blanker didn't garble on extremely strong signals. On many HF transceivers, engaging the noise blanker on 40 and 80 meters will cause most signals over S9 to become garbled. Not so with this noise blanker.

Selectivity on SSB is 2.4 kHz, and a convenient "filter" button next to the RF gain button allows you to kick in the 1 kHz SSB filter. The 1 kHz filter is already built in, and not an added option if you want to tighten up on an incoming weak signal. You can further home in on an illusive signal by rotating the IF shift knob to dodge the QRM. This same filter network offers 1 kHz or 1/2 kHz CW passband. And if you're into shortwave listening, you can click in 2.4 kHz AM narrow, or 9 kHz AM wide—including FM—for full fidelity reception.

The first IF is 71.75 MHz, the second at 455 kHz, and spurious/image rejection is listed as 70 dB. When I switched back and forth between several transceivers on the bench, the Alinco was more sensitive and just as selective as the higher price sets.

Everyone commented on the recovered audio on SSB as being "sharp." It's the same sounding audio I have heard from the Yaesu 900—nice full-fidelity treble without sounding tight or with a hiss. The DX-70, when tuned into a transmitting SSB station, is like listening to a hi-fi with bass, mid-range, and tweeters as opposed to an audio system with just a midrange speaker. It's hard to describe—listen for yourself.

The AGC is a function/AGC command on the same push button as the filter switch. The function button is conveniently located to the left of the set that makes it natural to depress with your thumb, using your forefinger for the other button.

I switched to 6 meters to confirm that all filters, noise blankers, AGC actions, and pre-amps weren't the same. I did notice on my big 6-meter antenna that 10 dB of pre-amp gain brought in a phantom sound of an FM or TV station way in the background that could never be tuned in. However, I didn't have that problem with the pre-amp turned on when I tested the unit on the mobile 54-inch whip.

I also tested the Alinco 6-meter receiver performance against a couple of other time tested 6m rigs and found the Alinco hotter on receive with the pre-amp clicked on than the other two units which I had running off of external amplifiers. And since the other two only ran 10 watts out, I didn't find the 10 watts from this Alinco to be out of line.

Mirage, now sold by MFJ, offers a 10-watt in, 150-watt out, 6-meter amp that I've seen selling for under $350, so getting more power is not all that difficult.

The front panel of the Alinco features a main tuning dial along with a smaller tuning dial. The smaller dial is rotated for memory channel select, megahertz or ham band select, and to change frequencies in specific kilohertz steps like 2.5 kHz, 1 kHz, or 500 Hz. This sub-knob reminds me of the click-click-click knob on the Kenwood TS-140. It's a handy feature. The main tuning knob resolves frequency down to 100 Hz (.1 kHz) dial indication, with 25 Hz steps if you ever-so-carefully turn the big knob.

The multi-function knob lets you quickly rotate through 100 memory channel locations which hold a surprising amount of memo-channel information: receive frequency, mode, any split TX, filter (!), AGC setting (!), RF gain amps or attenuators (!), noise blanker on or off (!).

This is a very smart memory that might allow you to independently select a CW frequency for fast AGC, narrow filter, no noise blanker, and RF pre-amp. On an SSB channel, you could memorize slow AGC, noise blanker, -10 dB attenuator, and the normal filter. I considered this versatile memory capability as a definite plus for this very compact rig.

Another nice feature is the high/low power output button. Unlike a slide switch or no power option at all, you can quickly reduce power to local stations or to reduce the current consumption of the radio on a dying storage battery.

There is a dial lock key to prevent you from accidentally turning the big knob when tuning channels in from memory. Like ICOM transceivers, memory positions allow for instant QSY from the big knob. This allows you to use the small memo knob to get you within a pre-set spot on the dial, and then use the big frequency knob. A quick flick of the small knob instantly puts you back to that original memory position. And when operating from the memory position for the digital modes, you would lock (electronically) the big knob to insure you don't accidentally bump off frequency.

Other buttons and knobs on the front would be the RIT capabilities; the "MF SEL" button to select memo, band, or frequency options; the little TX jewel LED that comes on for transmit; delta transmit; memory to permanent VFO selection; memory right, split, and priority—all the usual knobs on a HF transceiver.

If you press and hold the function key twice for longer than 2 seconds, "SE" will appear on the screen indicating you have set the Alinco DX-70 into the set mode. This is similar to the Kenwood TS-50 in the "menu" mode.

The multi-function small dial selects a whole bunch of set-up options.

The relatively large Alinco DX-70 English-written (!) instruction manual also gives procedures on a simple resetting of the mode settings, resetting all memory channels, simply resetting VFOs, or major reset that clears everything as if you had just purchased the equipment new from the dealer.

It gets better when you get to the back of the transceiver. There are the customary jacks for speaker or headphones, featuring the common miniature jack (not sub-miniature). There is the common CW jack for connecting a telegraph key or electronic keyer system. There's no built-in electronic keyer, but most hams prefer their own style of electronic keyer and never seem to like any type of built-in keyer. The CW key-jack is also a miniature jack, not the big 1/4-inch jack you would find on larger equipment.

There are also RCA jacks for ALC as well as relay. When the equipment is new out of the box, the relay is out of circuit. Cutting an obvious internal jumper wire, detailed in the instruction manual, lets the relay close when the microphone or key is depressed. The ALC input voltage from the amp needs to be zero to -3 VDC.

There's a small screw for connecting a ground foil tab, two antenna jacks plainly marked for HF and 6 meters, the heat sink, and then the power connector. More good news—it's the common 6-pin power plug that is used by Kenwood, Yaesu, and ICOM from a DC source.

There is an external antenna tuner connection which the book describes as being compatible with a Kenwood AT-50, a Kenwood AT-300, an ICOM AH-3, or even an SGC 230 automatic long-wire antenna tuner for field day/maritime mobile/mobile home applications.

While I didn't see an accessory jack for going digital, the microphone offers pin 6 as the detector output with associated pins for PTT, ground, mike ground, and 5 volts DC. Taka at Alinco, an avid HF digital operator, says this radio has full capabilities in the digital modes.

Power output on high frequency was a good 100 watts, and I noticed the average modulation level was around 60 watts, indicating only slight ALC action. This gave us a good punchy signal that everybody I worked commented about as being "hefty" and sounding great. The SWR protection circuit throttles back output down to 25 watts with no antenna, and a momentary antenna short-out pulled the power down to a safe 5-watt level.

On 10 meter FM the power output was also 100 watts. This surprised me because AM throughout the bands was only 50 watts. On 6 meters the power output was 15 watts SSB, 11 watts FM, and 6 watts AM.

I then tried operating on 10-meter and 6-meter repeaters, and everything was going along fine in entering the 10-meter 100 kHz offsets as well as the 6-meter 500 kHz offsets. But where oh where was the almost-always-necessary CTCSS selections out of menu? What, no subaudible tone encode? Oh yes, but it uses dip-switch programming.

The CTCSS encode is on the bottom of the transceiver, with no mention of it in the well-written and illustrated instruction manual. The tone board is included with the package, already installed, but you need your trusty toothpick and penlight to manipulate the 8 switches for any of 38 possible subaudible tones.

But besides that, ! enjoyed operating the equipment. The only thing I couldn't figure out when running the unit without reading the instruction manual was how to get it to go into the set mode. As soon as I cracked the books, it was right there.

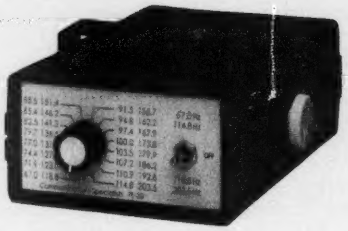
It has been many years since I have seen an HF transceiver with a VHF band included, so when you get a chance, head on down to your local amateur radio dealer and take a listen to the sharp high-fidelity action on the new Alinco HF + 6-meter transceiver.

73 Review

Number 22 on your Feedback card

by Larry R. Antonuk WB9RRT

TE-32 Multi-tone CTCSS Encoder



Imagine yourself traveling in a distant city. You and a non-ham friend are traveling to an important business meeting. You have some general directions, but you're not really sure where you're going. Reaching down to your mobile rig, you hit the scan button until the radio stops at an active channel. The conversation comes to an end, and you key the mic and call one of the stations. There's no reply, so you call again. Silence. Keying the mic a third time you notice that there's no kickback from the repeater, even though the strength of the signals would indicate that you're well within range. While you've been fiddling around with your radio, your friend has been reading a map; he tells you to get off at the next exit and take the first right turn. You arrive at the destination somewhat humbled, and certainly no better off because of your ham radio license. What went wrong?

Locked Out

Unless you have a broken radio, what went wrong is probably just the fact that the repeater you wanted to talk on needed a CTCSS tone to key it up. You may have heard of these tones at some point but really weren't paying attention. You don't need one for your home repeater, and even if you did your rig is a few years old—it doesn't have that feature anyway. But you sure needed that feature today. What exactly is a CTCSS tone, and why do some repeaters need them while others don't?

CTCSS stands for Continuous Tone Coded Subaudible Squelch, which describes exactly how the tones work. A subaudible tone is placed on the transmitted signal, just below the voice modulation. The tone is there all the time the transmitter is keyed, and it can control the squelch in the receiving radio. The CTCSS system was originally designed for commercial use, either to allow several companies to share a common frequency without hearing the other fleets, or to allow controllable access to community (multi-user) repeaters. Hams began to use the system in the late 70s, often to create "closed" repeaters. These repeaters would be open only to people who actually supported them. Supporters were given the proper codes, then had to add CTCSS capability to their radios. (Of course, an enterprising ham could simply decode the tone, and install this tone on his radio without paying to support the repeater. He would often find he had no one else on the repeater who would talk to him...) In the 90s, the use of CTCSS tones is mainly for preventing interference. As the bands get more crowded, more and more repeaters are going up. The frequency assignments for these repeaters are coordinated, but more often than not it's possible for mobiles in one state to be keying up their repeater, plus a second repeater in a different state, especially if the mobile happens to be on a high hill right between both the repeaters. The solution to this problem is simply to install a CTCSS decoder on at least one of the repeaters. Even though all the radios are still on the same frequency, the repeater will only key up if it hears a user with the proper CTCSS tone. The user chooses which repeater to access by changing the tone, not the actual carrier frequency.

What's the Key?

So what do you do if this happens to your hometown repeater? What if your rig doesn't have programmable tones? Maybe you're still using a crystal-bound rig, or even a converted commercial rig. Do you have to trade your rig in on the latest synthesized programmable whiz-bang unit? Of course not!

In the commercial two-way field, CTCSS tones are practically synonymous with Communications Specialists, Inc. The long time leader in CTCSS encoders and decoders, Comm Spec produces a multi-tone encoder designed exactly for add-on use, at a very affordable price. The TE-32 Multi-tone Encoder produces the 32 most common tones and is enclosed in a 5.25" x 3.3" x 1.7" cabinet with a bracket, ready for under the dash or under the shelf mounting. The TE-32 is based on the field-proven SS-32P board, which is a field-programmable CTCSS encoder designed primarily for installation in commercial mobile rigs. Usually programmed with a DIP switch, the SS-32 is slightly modified for use in the TE-32. Rather than the DIP switch, the tone frequency select lines are routed out to the front panel switches of the encoder. This allows easy access and instant changing of the tone frequency. As a matter of fact, the TE-32 consists of nothing more than the SS-32P, the rotary tone select switch, the toggle group select switch, and a nice box. There's plenty of open real estate in the box as well, but don't be put off by the small size of the unit. Communications Specialists products are all very well built, using custom-designed integrated circuits to keep things small and reliable.

How Do I Hook It Up?

All of the above may sound great, but you may be a little hesitant to rip your rig open and start poking around with a hot soldering iron. If you've never done any kit-building or electronic repairs before, you may want to get some help, but installing the encoder is really fairly simple. There are only three wires: + voltage, ground, and audio out (See Figure 1). In most rigs the power will not be a problem, as the TE-32 will operate within a range of 11 to 25 VDC, drawing only 12 mA. If your rig is somewhat more mature, the instruction sheet gives diagrams explaining how to power the unit off of 12- and 6-volt AC lines, as well as 200-VDC supplies. The power supply connections should be fairly straightforward, but the connection point for the audio may be a little trickier. The first thing to do is to check the schematic if one came with your radio (you did keep the manual somewhere safe, didn't you?). In many cases rigs were designed for add-on boards that weren't installed as standard equipment, and the tone input point will be clearly labeled on an existing plug or jack. If not, the best place to start looking is on or around the modulation control, usually on the center tap. This procedure is very well explained in the instruction sheet that comes with the TE-32. Once you have the connections all set, the only thing remaining is to adjust the output level. If you have a friend with a communications service monitor, great. Just set your tone mod at about 0.6 kHz deviation, and you're all set. If not, set the control to minimum and increase the level a little at a time until the repeater opens when you key up. Set the level a little higher than the minimum needed to open the repeater, but lower than the point where the tone becomes irritating. It's not unusual to hear a low level hum in the

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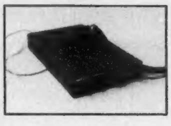

Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packeteers really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? ...No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

FX-50 kit (6 Meters)	$149.95	FX-146 kit (2 Meters)	$149.95
FX-223 kit (1 1/4 Meters)	$149.95	FX-440 kit (3/4 Meters)	$169.96
CFX matching case set	$29.95	FXM-1, ICOM/Yaesu style speaker mike	$29.95

QRP AMPLIFIER

For a slick little QRP boost, use one of the 20 Watt amplifiers. Needs only 1/2-2 watts of drive for full output, linear for SSB, AM or CW operation, power MOSFETs for high effieciency and multistage low pass filter for a clean signal. Built-in T/R relay for automatic switching, runs on 12-15 VDC at 2-4 amps. Add our matching case set for a complete station look.

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2WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantastic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10.000 µV output levels • High receive sensitivity, less than 5 µV • 100 kHz to 999.9995 MHz • Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder • 1 KHz and external modulation.

COM-3 2 Way Radio Service Monitor	$2995.00

2 MTR & 220 BOOSTER AMPS

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz units. Both have all the features of the high-priced boosters at a fraction of the cost.

PA-10 2 MTR POWER BOOSTER (10 X power gain) Fully wired & tested	$99.95
PA-20 220 MHz POWER BOOSTER (8 X power gain) Fully wired & tested	$99.95

FOXHUNT HEADQUARTERS

Locate hidden or unknown transmitters fast. The Foxhound direction finder connects to the antenna and speaker jack on any radio receiver, AM or FM from 1 MHz to 1 GHz. The antenna (a pair of dipole telescopic whips) is rotated until the Null meter shows a minimum. A pair of LEDs indicate to turn Left or Right. The Foxhound is ideal to use with a walkie-talkie. if you wish to transmit, go ahead, a built-in T/R switch senses any transmitted RF and switches itself out of circuit while you talk. It doesn't get any easier than this! We provide all parts except for a few feet of 1/2 inch PVC pipe avialable at any hardwar e store for a dollar or two. Add our matching case set for a complete finished unit. Be the one with the answers, win those transmitter hunts and track down those jammers, you'll do it all with your Foxhound.

Add some fun to your club events by having a transmitter hunt! Foxhunting is a craze sweeping the nation, but many clubs are missing out on the action because they lack the expertise or time to develop their own foxhunt transmitter. We set one of our most devious and sneaky engineers to the task of designing an easy to build and use, yet highly capable Foxhunt transmitter. A snazzy microprocessor controller has both preset and programmable transmission characteristics allowing you to easily set the difficulty level from "beginner" to "know-it-all"! The SlyFox, FHT-1, is crystal controlled in the 2 meter band (crystal for 146.52 included) with a power output of 5 watts that is adjustable by the controller.The transmitter is programmed to ID in CW or add our voice option if you really want to aggravate the troops - "Ha ha, you can't find me!" Join the fun, get rid of those stuffy old meetings and picnics, have a foxhunt!

DF-1 Foxhound direction finder kit	$59.95	CDF Matching case set for DF-1	$14.95
FHT-1 SlyFox Foxhunt transmitter kit	$129.95	FHID-1 Voice ID option	$29.95
CFHT Heavy duty metal matching case set for FH T-1	$29.95		

SX-20 20 METER SSB/CW TRANSCEIVER

Finally, a handy go anywhere rig that puts the fun back into ham radio. How about the DDS synthesizer that tunes in 10 Hz steps with exceptionally low noise for weak signal reception. Or, how about the built-in lambic CW keyer that has a digital readout of your CW speed. Perky 10 watt RF output (that's only 11/2S units below a 100 watt rig!) can be tuned down for true QRP operation. Included with the SX-20 is the hand mike with handy UP/DOWN buttons for remote tuning of the rig while driving — or biking — or boating. Available in both fully assembled and fun to build kit form, you'll find that the SX-20 will become your favorite rig.

SX-20 20 meter SSB/CW Transceiver, fully wired, 1 yr. warranty	$429.95		
SX-20 20 meter SSB/CW Transceiver Kit Form	$349.95		
Optional CW Audio Filter SXCWN WT	$49.95	Kit	$39.95

PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly NO TUNING". Includes FREE disk software, PC Board and Full Documentation. Kit form.

P-64A	$59.95	P-IBM	$59.95	CASE CPK	$14.95

Miniature SPEAKER-MIKE

Fits Icom, Yaesu, Alinco, Ramsey and Radio Shack rigs! Looking for a handy little speaker-mike to compliment your FX transceiver or other ICOM style handie-talkie? The Ramsey SM-1 speaker-mike is a beauty. It's only 1 1/2" wide by 2 1/2 inches high and has a handy clip on the back so you can easily clip it to your lapel or shirt. Its small internal speaker isn't going to break any eardrums but is very clear and has plenty of pop to be heard when worn. There's even a jack on the mike so when you plug it in, you still have the use of the speaker jack from your radio. Fits all Radio Shack, ICOM, Yaesu, Alinco and Ramsey rigs.

SM-7 Mini-Speaker mike, Fully assembled	$24.95

CW KEYER

Send perfect CW. Microprocessor keyer features 4 programmable memories of up to 26 words each, lambic keying, dot-dash memory, variable speed from 3-60 WPM, adjustable sidetone, keying to any rig and fully RFI proof. EAROM memory keeps messages up to 100 years - you'll go silent before the key! Includes built-in touch paddles or use your own. Easy assembly and matching case set available for a nice station look.

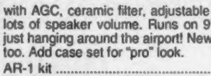
CW-700 Micro keyer kit	$69.95	MK Matching case set	$14.95
CW-700WT Assembled CW-700and case	$119.95		

ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!

AA-7Kit	$28.95	Matching case & knobset, CAA	$14.95

AIRCRAFT RECEIVER



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AR-1 kit	$29.95
Matching case set, CAR	$14.95

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4-11 MHz. True superhet, has smooth varactor tuning. AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project, provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3-22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SR1	$29.95
Shortwave converter kit, SC1	$27.95
Matching case set for SR1, CSR	$14.95
Matching case set for SCI, CSC	$14.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.

PA-1, 40W pwr amp kit	$34.95
TR-1, RF sensed T-R relay kit	$14.95

MINI KITS

Ramsey carries a complete line of low cost, easy to build, easy to use functional kits that can be used alone or as building blocks in larger more complex designs. Mini-kits include audio amps, tone decoders, VOX switches, timers, audio alarms, noise-makers and even shocking kits! Call for our free catalogue!

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Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna

FM-10A Stereo transmitter kit	$34.95
CFM Case,whip ant set	$14.95

SPEECH SCRAMBLER

Descramble most scramble systems heard on your scanner radio or set up your own scambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler /descramblerkit	$39.95
CSSD matching case set	$14.95
SS-70WT Assembled SS-70 and case set	$79.95

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugur cube - including battery and mike. Two sets of SMT parts supplied in case you are clumsy! Terrific audio pick-up (pin drop at 5 ft) and transmit range of 300 ft. We include the battery (watch style), electret mike and even a tuning tool! Be a James Bond and learn SMT too!

FM-5 Micro mike kit	$19.95

CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit	$19.95

DR. NI-CAD CONDITIONER/FAST CHARGER

Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour-just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge-batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.

DN-1 Dr. Ni-Cad conditioner/fast charger kit	$49.95
CDN Matching case set	$14.95
DN-1WT Fully assembled Dr. Ni-Cad with case	$89.95

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CIRCLE 34 ON READER SEVICE CARD

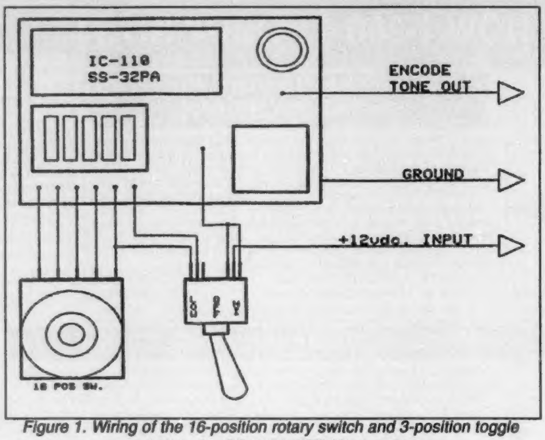


Figure 1. Wiring of the 16-position rotary switch and 3-position toggle switch to the SS-32PA CTCSS encoder.

background of your audio—that's the actual CTCSS tone. This will be more or less audible depending on the tone level, and the actual tone that you're using. (High frequency tones (203.5) will be more audible than the lower tones (67.0). As long as the level is low enough so people don't ask about "that power supply hum in your audio," you should be OK. Tie down the cables, mount the TE-32 under the dash, and you're on the air.

How Do I Run It?

Operation of the TE-32 encoder definitely does not require a degree in rocket science. The three-position toggle switch selects low range (67.0-114.8), high range (118.8-203.5) and no tone. You simply dial in the desired tone, and hit the PTT.

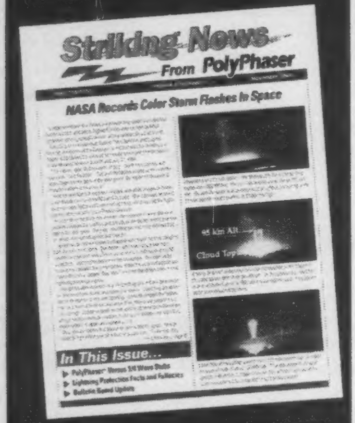
A Minor Drawback

Perhaps the only point that's less than ideal with the encoder is the fact that the frequency select switch is a sixteen-position unit. This makes the divisions a little close together, and it's difficult to see what tone is actually selected unless you're looking directly at the face of the unit. Not only that, but the rotary switch is a continuously variable unit—there are no end stops to start counting clicks from. Not a problem on the test bench, but if you mount the encoder in a mobile you may want to keep it close to the driver. (If you purchase the TE-32 for use around the same two or three repeaters you may choose to replace the sixteen position switch with a three position unit, and use a simple diode matrix to select the three different tones. This is also well documented in the instructions, but basically consists of pulling the proper lines low for each of the desired frequencies, and using diodes to provide isolation between the lines.)

A Good Choice

The Communications Specialists TE-32 Encoder is a winner all around. Based on solid field-proven technology, easy to install, well documented, and backed by a one year factory warranty, the unit is a very safe bet for anyone needing multiple CTCSS tone capability in a base station or mobile rig. Whether you need CTCSS capability for local repeater access, or you just need an evening project and want to give an old rig a new lease on life, the TE-32 is a good choice for the job. 73

Do You Know...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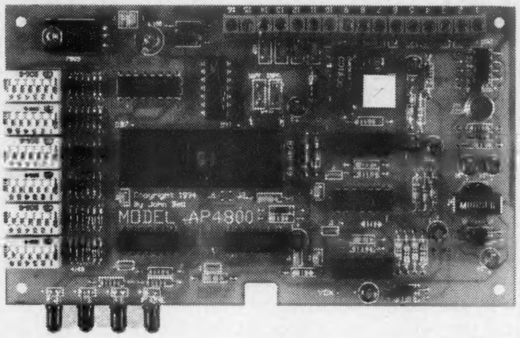

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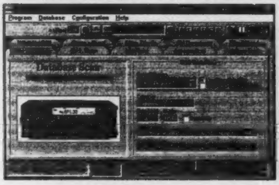

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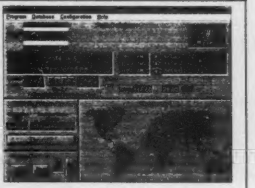

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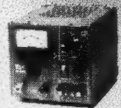

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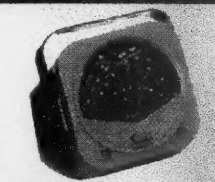

Model		CN-410M	CN-460M	CN-465M
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	Reflected	5 W/50 W		5 W/25 W
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SWR Detection Sensitivity		3 W min		
Dimensions/weight		71W x 78H x 100D mm/300g		

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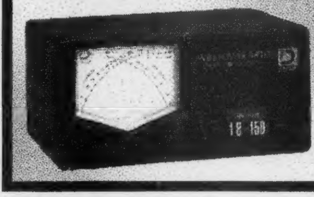

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Key It!

By Michael Jay Geier KB1UM

Chances are, you're using a modern, solid-state HF rig. Although there are still plenty of the older, tube-based radios around, by and large they've gradually been replaced by newer transceivers. Newer is better, right? Well, not always! In one respect, the old tube sets had a big advantage: they were easier to interface to linear amplifiers. Back in the old days, voltages were higher and the currents peripheral equipment was expected to need were higher, too. The transmit/receive switching in HF radios was just about always done with a relay, which gave you nice, high-current contacts with which to key your amplifier.

My, how things have changed! These days, most radios use solid-state T/R switching. Some do have small relays, but they often are only for the keying of external devices like amplifiers. So, what's the problem? Can't you just hook up your amp's relay and go? Well, sometimes, but it may not be that simple.

Can't Take It

Unlike with transceivers, linear amplifiers have not, by and large, been replaced by newer equipment. Sure, there are many new models around, but older amps are very durable, and there is little or no functional improvement to be had with a newer one, unless you buy one of the top-of-the-line microprocessor-controlled whizbangs costing many thousands of dollars. Consequently, many hams are using new radios with old amplifiers.

That leads to the common situation in which the keying transistor or reed relay in the radio simply can't handle the current required by the older amplifier's relay. So, how do you interface the two?

Many manufacturers provide optional, external relay boxes. These contain some kind of current amplifier circuit and a relay whose contacts can handle the required current for the amp. So, why not just buy one? Certainly, you can do that, but there are reasons why you may want to build your own. Although most relay boxes are not particularly expensive, they may cost more than you feel like putting out, or they may have to be ordered, causing a long delay in your gettng your station set up. Or, perhaps, your radio is just old enough that they're not making the accessories for it anymore. Finally, you might just want to do it for fun, or to provide a current buffer for a radio which offers no relay box.

A New Approach

Nearly all solid-state radios key their PTT lines by pulling them from some nominal voltage, at low current, down to ground. In other words, they are designed to sink a small amount of current from an external device when you transmit. That method complicates the interfacing issue- it would be easier to design the current amplifier if the transmit signal went *up,* not down. Of course, the issue is not insurmountable, but it generally leads to the same solution: the use of a PNP transistor in the relay box. That works well enough, but it has a significant drawback: it forces your radio's PTT line to sink current, because the PNP design requires the transistor's base to be pulled down in order to turn the relay on. Is that a problem? Not always; remember, that's what the radio is designed to do. As long as you keep that current low, and you don't have too many other gadgets, such as RTTY or SSTV units, doing the same thing, it may work fine. But, you could force your rig to take too much current, damaging it. Or, you may put too high a

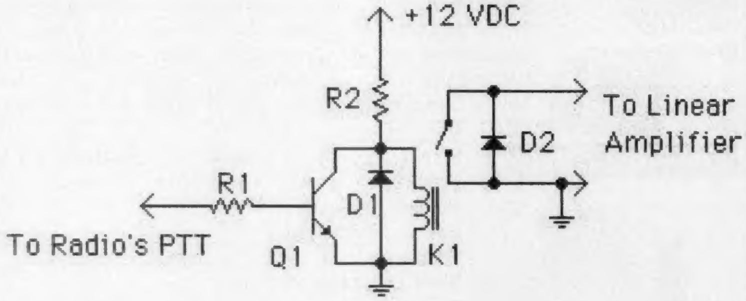

Figure 1

R1	10K
R2	See Text
Q1	2N2222 or similar
D1, D2	1N914 or similar
K1	Normally Open, See Text

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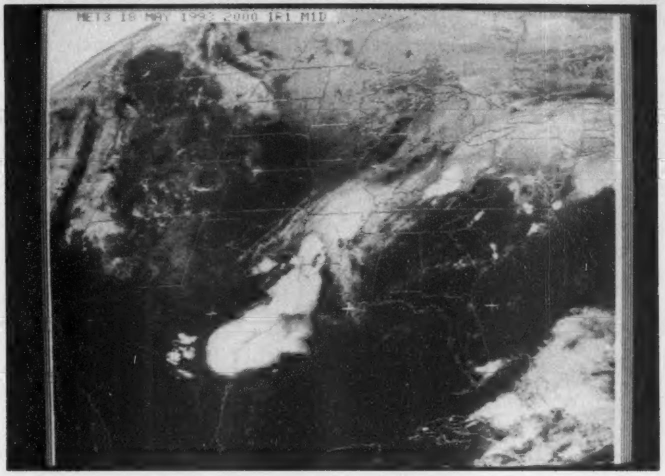

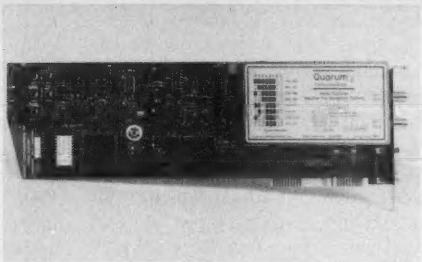

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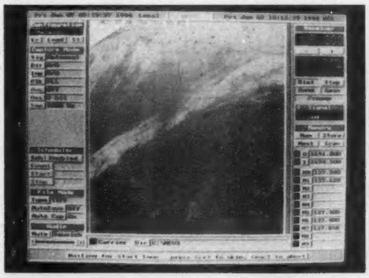

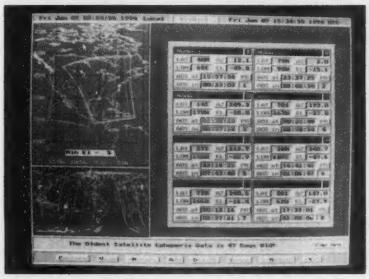

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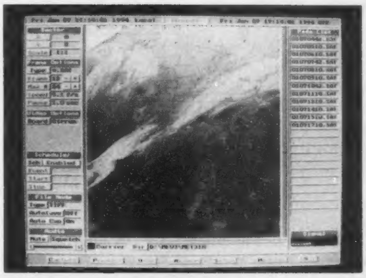

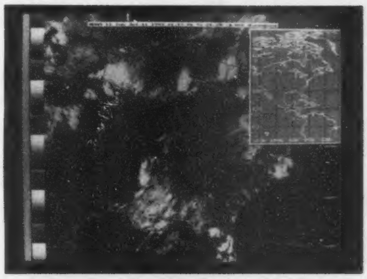

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voltage into it, which can cause damage if the keying is provided by a power IC which uses a supply voltage lower than the one you're trying to pull down.

I designed "Key It" with one objective in mind: it must not force the radio to sink current. So, I avoided the use of a PNP transistor, choosing instead an NPN. That, of course, makes the keying direction backwards. In other words, the base of an NPN transistor will turn on when the input voltage goes up, not when it pulls to ground. "Key It" gets around that problem by using the transistor in an inverting circuit.

How It Works

Take a look at Figure 1. The base of the current amplifying transistor connects through the 10k-ohm resistor to your radio's PTT line. It puts no current into that line. Rather, it takes a small current *from* the PTT circuit during receive! Connected across the relay coil, it pulls power from the station power supply, or the radio's accessory connector (more about that later), through R2, and effectively shorts out the relay, keeping it open. When you transmit, the input to the transistor's base goes to ground, causing the transistor to open. That lets the relay coil take the current, pulling in the relay and keying the linear amplifier via its contacts.

You might ask why I didn't opt to simply let the relay operate backwards and use its normallly-closed contacts. That would indeed make them open during receive and closed during transmit, but it would also have the secondary effect of keeping the relay closed most of the time. Why not do that? I've found that relays which stay closed too much tend to get magnetized and stick closed even when power to the coil is removed. For reliable operation, it's best to keep the relay unenergized as much as possible.

Calculating R2

In order to prevent overheating of the transistor, and also possibly of R2, it pays to keep the overall current down as low as possible. The key to doing that is to select a relay for K1 that needs little current to pull its contacts in. That lets you use a bigger resistor for R2, and also requires less dissipation by the transistor.

Assuming you're going to use a 12-volt supply, it's best to select a 6-volt relay, with as high a coil resistance as you can find. A reed relay is a great choice, as long as its contacts can handle the current your amplifier's relay needs. So, let's say you pick a 6-volt reed relay with a 1400-ohm coil. How do you find R2's value? Since you want to drop about half the supply voltage, simply use a resistor with the same resistance as the relay coil's: about 1400 ohms! What could be easier than that?

Most likely, you won't find one that's exactly the same. Probably, you can get within a few hundred ohms or so. If you have to choose a resistance value above or below the coil's value, pick one above. Heck, a 12-volt supply is really about 13.8 volts, and most relays will pull in quite reliably at voltages a little less than they're rated for, anyway. Remember, the aim here is to reduce the total current, and higher resistance does that. Choosing too low a value will cause the transistor to overheat, and may feed too much voltage to the relay, causing magnetizing and sticking problems.

In this circuit, just about any little NPN transistor, such as a 2N2222A, will work fine. If you want to be sure, though, you can calculate the transistor's required power dissipation quite easily: just find the total current, which is your power supply voltage (probably 13.8 volts) divided by R2. In this case, that would be 13.8/1400, or 0.0098 amp, or about 10 mA. Now, multiply that by the 13.8-volt supply voltage, and you've got your power in watts. Our example circuit requires just under 140 mW of dissipation in the transistor, making that 2N2222A a good choice.

Details

The only thing left is to add a couple of diodes to prevent damage from reverse-current spikes generated by the relay coils. I put one across the Key It relay's coil, and another across its contacts, in order to dampen out the spikes created by the relay coil in the linear amplifier.

If you use a fast reed relay, you can use this circuit for QSK operation, provided your amplifier can take that kind of use; most older amps cannot. Also, this circuit assumes a common ground between the 12-volt supply and the radio, and it also assumes that your amplifier is keyed by pulling its relay coil's positive voltage to ground. Both of these are the normal situations. If, though, your amp requires something different, you can still use Key It, but you may have to remove D2, or reverse its direction. Remember, it should always be connected opposite to the normal direction of current flow—be sure to connect the cathode to plus.

Earlier, I mentioned the use of the radio's accessory connector. You can use it to power this circuit, but be absolutely certain that the total current required by Key It is less than the accessory connector is rated to supply. In general, those connectors are meant for pretty low-current stuff, and may not be able to handle Key It. In that case, use your station's 12-volt supply, or even a little wall cube if you have to. If you do go the cube route, try one rated at about 9 volts; with the low power requirements of this circuit, the unregulated cube will probably be at about 12 volts anyway. If you use a 12-volt cube, it may supply more like 15 volts, which could be too much!

That wraps it up! Now, you can key that old amplifier without fear of harming your radio. You don't need high current capability from the radio, and you won't be asking it to sink any current, either. Truly, new meets old and both are happy!

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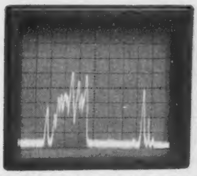

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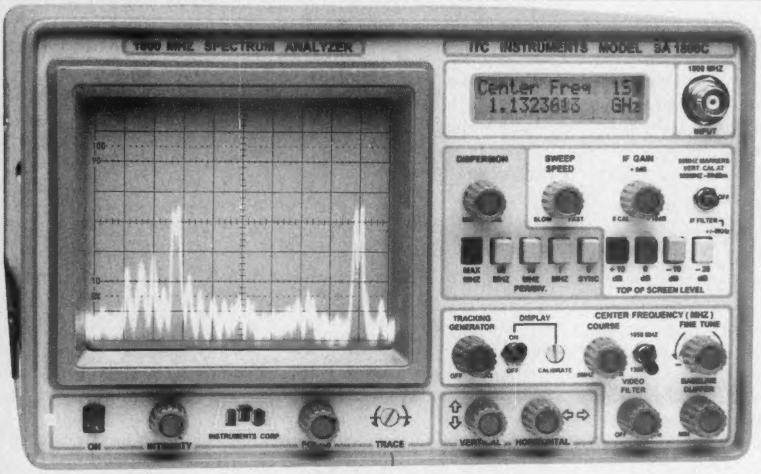

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CIRCLE 149 ON READER SERVICE CARD

73 Review

Number 30 on your Feedback card

by Dean Lewis WA3WGV

The Hamtronics RWWV Receiver

A precise, dedicated receiver for WWV.

Time and frequency standards stations WWV and WWVH have been providing an "all-news" format long before it was popular on broadcast radio. Hams, amateur and professional astronomers, laboratories, universities, and the military are just some of the users who rely on information available every hour that goes well beyond the familiar time ticks and audio tones. WWV's regular schedule of official announcements includes OMEGA Navigation System Status Reports, Marine Storm Warnings (storms at sea), Global Positioning System (GPS) Status Announcements, and Geophysical Alerts. These "Geoalerts" provide information on solar activity and the earth's magnetic field that affect radio propagation, and are of particular interest to hams.

Hamtronics Inc. of Hilton, NY, has produced a crystal-controlled board-level receiver kit for reception of WWV/WWVH on 10 MHz. Also available in assembled form, the receiver provides outstanding sensitivity and selectivity, but is easy to assemble and align.

Why a dedicated, crystal-controlled receiver for WWV? Many hams today work only VHF or UHF, many others buy or build the popular (mostly QRP) monoband CW or phone rigs, and in either case may not have an HF receiver covering 10 MHz. Anyone who monitors frequently will appreciate the size and convenience of a unit they can simply turn on and off as needed, with no tuning or adjustment. Amateur astronomers who rely on the accurate time signals will take advantage of the small size, simple and reliable operation, and strong audio output needed when working outdoors.

The manufacturer's specifications for the receiver are as follows:

- Mode: AM reception, 10.000 MHz, crystal-controlled
- Sensitivity: 0.2 µV for 10 dB s/n
- Selectivity: ±3 kHz at -3 dB, -50 dB @ ±10 kHz
- Image Rejection: 43 dB
- AGC: both IF and RF AGC
- Operating Power: 9–14 VDC, 80 mA at min. volume
- Circuit Board Size: 2-5/16 x 3 inches

Antenna input impedance is 50 ohms; audio output is up to 2 watts into an 8-ohm speaker. An optional squelch circuit is included to silence the output if the signal fades to an unusable level. An on-board volume control is included; a panel-mounted control can be substituted. The physical size of the circuit board lends itself to a variety of packaging methods after assembly.

The Circuit

The circuit board is FR-4, double-sided, with a continuous ground plane on the top surface; all holes are drilled and plated through. The board was obviously designed along the same lines as high-quality VHF/UHF circuits, which comprise most of Hamtronics' product line.

The circuit design is a straightforward superhet. Seven tuned circuits provide the selectivity, and intelligent use of integrated circuits provides high performance with a minimal parts count.

RF input at 10.000 MHz is amplified by a dual-gate MOSFET, then mixed with the crystal-controlled 10.455-MHz local oscillator output. After IF amplification and detection, the AF signal is boosted by a speaker driver IC. The detector develops two AGC signals. One of these controls gain in the IF amplifier stages. The other is used to bias gate 2 of the RF amplifier MOSFET. This signal is also used as a tuning indicator during alignment of the circuit, and operates the squelch.

Assembly

Assembly took about 4 hours, at a leisurely pace, double-checking each part before soldering. The process was a real pleasure: challenging, but with no problems. All parts fit perfectly. This was the best set of assembly instructions I've ever followed. The sequence in which the information is presented made assembly easier, and the Theory of Operation and Troubleshooting sections provided a thorough explanation of the circuit. Follow the assembly sequence just as specified; "landmark" parts first, then the smaller components are easy to locate. Although resistors and capacitors must later be fitted down between the IF transformers, it's not at all difficult.

Soldering was easy with a grounded iron, a 33-watt element, and a pencil-point tip slightly blunted with a file. When you are installing the integrated circuits, I'd suggest not bending the pins to fit the hole spacing, but insert one row of pins and "spring" the other row into place; it helps hold the IC to the board, thus keeping it from falling out when the board is turned over for soldering. For the off-board connections, stranded 22 AWG wire fits the holes perfectly.

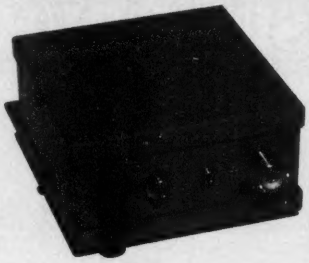

Photo A. WA3WGV put the Hamtronics RWWV receiver in this box

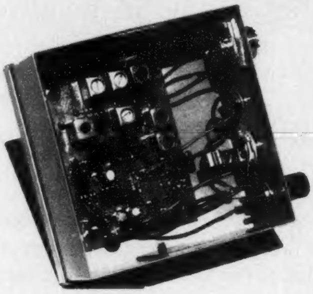

Photo B. The Hamtronics RWWV receiver circuit board

One last suggestion: Before installing any parts on the board, lay it flat on a blank sheet of paper and trace a drilling template for the four mounting holes. This will be handy later, when you mount the completed board in an enclosure. If you already have the enclosure, trace the mounting hole positions directly.

Alignment

Alignment is accomplished by supplying an accurate 10-MHz signal and sequentially adjusting the tuned circuits, tuning for minimum AGC voltage. I don't own a signal generator. At the time I completed assembling the circuit and making the off-board connections, WWV's signal was very strong on another receiver; therefore, I initially tried aligning the circuit using only the off-the-air signal. Without going into the details, take my word for it: It doesn't work. The tuned circuits are just too sharp to start alignment this way. Having a few computer clock oscillators on hand, I connected 6 volts to a 10.0000-MHz unit and coupled it to the receiver's input through a .01 µF ceramic disc capacitor. After initial

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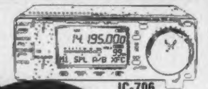

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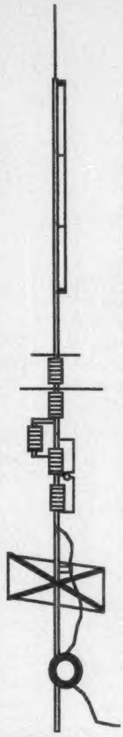

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The MINI STATION is a very similar to a QUANTUM battery, except theirs costs about $200.00 with its special adapters. The MINI STATION utilizes your HT's cigarette power cord. In addition to a wall charger, it comes complete with a handy carrying pouch that has a removable shoulder strap. The pouch also has a belt strap that buckles, so you don't need to unfasten your belt to wear it.

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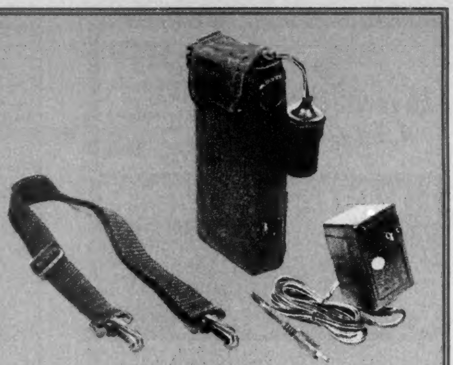

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CIRCLE 384 ON READER SERVICE CARD

adjustment of each coil, I disconnected the oscillator from the receiver and placed them next to each other, increasing the distance for a weaker signal each time I went through the sequence of tuning each circuit. This worked very well; tuning for minimum AGC voltage was easy. Because there is some interactivity among the tuned circuits, you'll want to go around several times.

For others who don't have access to a signal generator, I'd recommend the same alternative. Radio Shack doesn't carry the oscillators, but several mail-order sources exist, and major walk-in parts wholesalers have them. Cost is only around $4.00. The schematic and pin connections are illustrated in Figure 1.

Performance

I knew the receiver was working when I turned off the signal source oscillator and immediately heard WWV with only 8" of wire connected to the antenna terminal. A telescoping antenna brought in both WWV and WWVH that evening (WWVH ends their half-hourly identification message with "Aloha"; nice touch).

The audio level fills a room, without distortion, well before reaching maximum on the volume control; it easily drives even a large stereo speaker.

The AGC is a good feature, and much more convenient than I had imagined it would be. I used the on-board volume control, and I never need to touch it, even when switching from speaker to headphones. It's interesting to leave the meter connected to the AGC line and watch the signal strength as it varies due to propagation. An "S" meter could easily be added.

Of the several frequencies on which WWV transmits, 10 MHz was the right choice for a monitor. With this combination of a reliable frequency and a sensitive receiver, there have been very few days or evenings since I built it that the signal was not usable.

You'll want to build the circuit board into some kind of an enclosure. The small size lends itself to just about any kind of final assembly you prefer. I installed a 5-foot telescoping antenna (Russell Industries, Inc., 3069 Lawson Blvd., Oceanside, NY 11572, part no. W-3H, 11 sections, 60" extended, 6-3/4" collapsed), but have found that the full length is rarely needed for reliable reception.

If you don't plan to run the receiver indoors on a 12-volt power supply, eight AA alkaline batteries will last for many hours and fit easily with the circuit board in a small project box. An assembly option includes a (supplied) resistor for 9-volt operation. This battery is smaller, and should be adequate for typical brief listening periods. You could even build it all into a speaker cabinet; all that's needed is an external antenna and on-off switch. If you don't like the austere look, add panel-mounted volume and squelch controls.

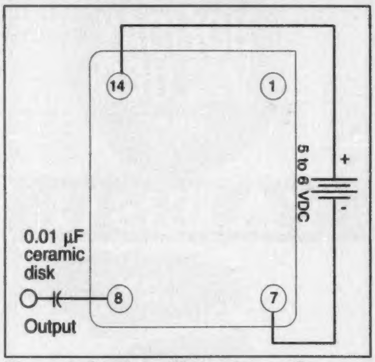

Figure 1. Clock oscillator pin-out diagram.

Summary

I don't believe you'll get better WWV reception on any other receiver. Add to that the pleasure of assembling a really well-designed kit of a finished size that can be packaged any way you want, and a reasonable price for the quality. The model RWWV is available in kit form for $59, wired and tested at $99, from Hamtronics, Inc., 65 Moul Road, Hilton, NY 14468-9535. Phone 716/392-9430; fax 716/392-9420. Now, who'll be the first to modify one for 30 meter CW? ■

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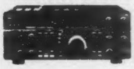

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A Milliohm Adapter For Your DMM

Expand your meter sensitivity

by Marion D. Kitchens K4GOK

The lowest resistance scale on most DMMs is 200 ohms, allowing resolution of 0.1 ohms maximum. This is adequate for many purposes, but there are times when lower value resistances simply must be measured, and measured with greater resolution. A lot of problems occur around the shack because of poor pins and sockets on connectors, because of oxidized contacts on switches, and other similar circumstances. A particularly troublesome item is a relay with dirty or pitted contacts. Many small slide-type switches are notorious for fouled switch contacts. And we've all had unpleasant experiences with bad microswitches. It is often difficult to determine if the low-voltage winding of a power transformer is shorted or not, and sometimes center tap connections are not obvious. When the problem is a simple open or shorted connection, that is readily determined, but when partially open or shorted situations occur a way to measure low-value resistance is required. The milliohm adapter described here is quite helpful in those situations.

The adapter also serves a multitude of other purposes around the radio room and builders work bench. When designing high current power supplies, it is necessary to know the "internal" resistance of the windings. That property is seldom available, but can easily be measured with the adapter describe here. You can even measure the internal temperature rise of a transformer, by comparing the cold and warm resistance measurements. I suspect you could measure the resistance of a cold solder joint as well, but I could not find one to measure in my shack <Grin>.

Photo A. Completed lilliohm adapter.

The milliohm adapter is a simple, but effective test instrument. It is simple enough to be wired on perfboard, or a PCB can be made from the foil pattern provided. All the parts are available from most peg board sources like Radio Shack or JimPak. There is nothing fussy or critical about the components or in calibrating and using the instrument. The adapter can be powered from a wide range of supplies from 5 to 12 VDC, and because it consumes power (100 mA) only when actually making a measurement, battery operation is practical. The instrument plugs directly into your DMM for clutter-free operation as shown in the photo. The circuit design precludes the necessity of correcting for the test lead resistance, which otherwise would be a significant part of the very low value resistance this instrument is capable of measuring.

The milliohm adapter has two basic resistance ranges of 2.000 ohms full scale and 20.00 ohms full scale. The lower range results in a maximum resolution of 0.001 ohms, or 1 milliohm per digit of display on a 3-1/2 digit DMM. Thus the name of milliohm adapter.

Circuit

Figure 1 shows the schematic of the milliohm adapter. The LM317 is operated in a constant current mode at 100 mA, set by the 15-ohm resistor paralleled with the 100-ohm trim pot. The two 2.2 MFD caps assure stability of the LM317. The circuit applies exactly 100 mA to the resistor under test, thus producing a

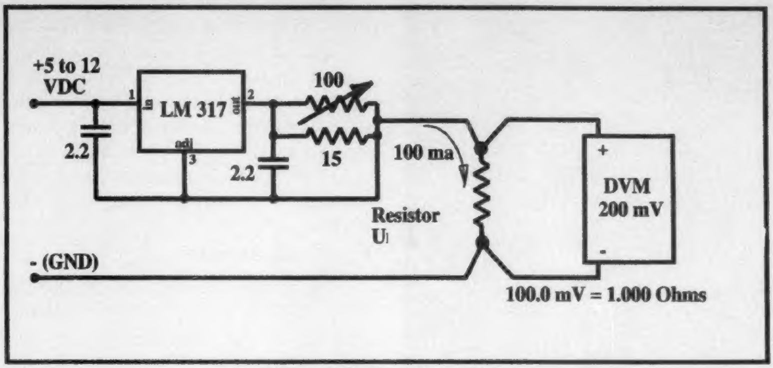

Figure 1. Schematic drawing.

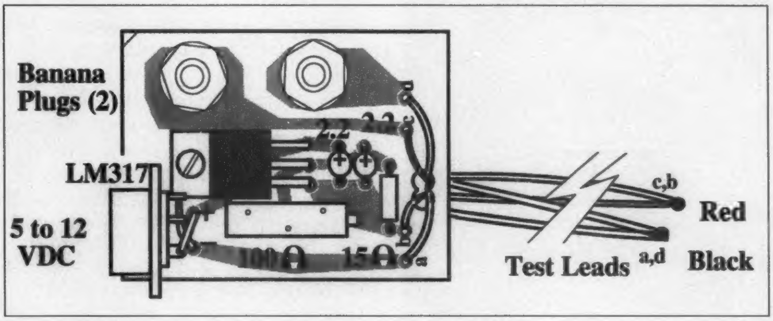

Figure 2. Parts placement drawing.

voltage directly proportional to the value of the resistor. The DMM then displays the resistance as a voltage. A voltage reading of 100.0 millivolts equates to a resistance of 1.000 ohms. Note that this is a four-wire system, assuring none of the 100 mA current flows thru the leads to the DMM and thereby eliminating any affects of the test leads on the measurement.

Construction

Figures 2 and 3 show the parts placement and the PCB foil pattern, respectively. The PCB construction is recommended, but perfboard construction is quite adequate. The photo shows a finished PCB ready for test lead attachment and mounting. There is nothing critical or fussy about the layout, just keep the 2.2 µF cap leads short and close to the pins of the LM317.

Install the LM317 first and bolt it to the board with a 4-40 screw. Note the polarity of the tantalum caps and install them correctly. Add the 15-ohm resistor and the 100-ohm trim pot to complete mounting of the components. The holes for the banana plugs should be slightly oversize to allow alignment with your DMM jacks. Install the banana plugs in the jacks of your DMM first, and then place the PCB over the plugs and tighten the mounting nuts on the banana plugs. Note that only the metal part of the banana plugs are used; discard the insulators. Four nuts are required—2 on each side of the PCB, so you may have to purchase four banana plugs to get the nuts.

Mount a power connector of your choice on the PCB. The small coaxial connectors shown in the drawing and photos are recommended, but any connector you have will do. Make sure the power connector polarity is correct; there is no circuit protection for reversed polarity.

Make a set of test leads by twisting together two 2 foot long pieces of red wire, and soldering them together at one end only. You should have a 2 foot long, twisted test lead connected at one end only. Repeat that with two pieces of black wire for the second test lead. The four unsoldered ends of the test leads are soldered to the PCB at points a, b, c, and d as shown in the drawing. The two red test leads go to points b and c, and the 2 black leads go to points a and d. Study the drawing carefully to be sure the connections are correct. Your test clips or other connectors will be attached only after check out and calibration.

Check the PCB for solder bridges and unsoldered joints.

Check Out and Calibration

Apply power from a 5- to 12-VDC source. There should be no current flow from the power supply at this point in check out. Make sure that the supply positive voltage appears at the end of the red test lead, and that the black lead is at ground potential. Adjust the 100-ohm trim pot for a mid-range position. Set your DMM on the 200 mA current range, and connect it between the ends of the red and black test leads. The DMM should show about 100 mA of current. Calibrate the unit by adjusting the 100-ohm trim pot for a current of exactly 100.0 mA on the DMM. Note that best accuracy will be obtained if the unit is calibrated with the power supply to be used in normal operation. Disconnect everything from the milliohm adapter.

Plug the instrument into the DMM jacks and set the DMM for 200 millivolts full scale. Apply power, and the DMM should show an overflow. Next short the two test leads together directly at the solder joints (do not use clips or connectors on the test leads for this test), and the DMM should read 000.0 or 000.1 If the reading is more than 000.2, find the problem and correct it before proceeding.

Recheck that the current through the test leads measures exactly 100.0 mA with the mA meter connected between the red and black test leads. Attach test clips to the red and black test leads. Short them

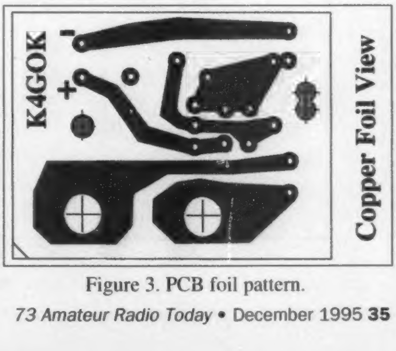

Figure 3. PCB foil pattern.

C. Adapter in use with Beckman DMM.

together and read the DMM on the 200 millivolt scale. Your DMM will now most likely read a small voltage. That is the resistance of your test clips and a measure of their connection quality. Wiggle the test clips for a better connection, if possible. The instrument is now ready to be mounted in a container and put to use. The photos show a completed unit mounted in a contained made from PCB material. Note that if your DMM shows negative readings (a minus sign), that can be remedied by reversing the test lead connections are points c and d' on the PCB.

Using the Adapter

Plug in the adapter, set the DMM to 200-millivolt range, apply adapter power, and make measurements! Note that this is a 4-wire instrument, and that for proper operation there should always be four wires directly to each resistance being measured—any other arrangement will cause errors. The test leads as recommended will assure proper operation. Also note that this unit actually measures voltage, therefore all power must be removed from the resistance being measured.

A Closing Note

The accompanying data chart provides some enlightening information. First those slide-switches with high resistance were dumped, immediately. Note the voltage drop the transformers will have at rated output. Some relays had quite high contact resistance, and they were all old, but unused. Gotta watch those relays!

milliOhm Adapter Data

K4GOK
Mar 95

Transformers

30V @ 6A	0.16 Ohm
12.6 @ 1.2A	1.04 Ohm
12.6 @ 2.0A	0.56 Ohm

Switches

Slide	0.055 to >20
Micro	0.011 to 0.030
Micro	0.024 to 0.100
Toggle	0.009 to 0.021
Toggle	0.008 to 0.025
Toggle	0.013 to 0.031
Toggle	0.018 to 0.032

Relays

#1	Close	1.540 to 0.200
	Open	0.033 to 0.092
	Some	>> 20
#2	Close	0.022 to 0.022
	Open	0.200 to 0.530
	Some	>> 1.0
#3	Close	0.015 to 0.122
	Open	0.015 to 0.018
#4	Close	0.020 to 1.750
	Open	0.016 to 0.060
#5	Close	0.050 to 0.052
	Open	0.923 to 3.400
	Some	>> 20

NOTE: All Data is in Ohms

Table 1. Data Chart Showing Measured Data.

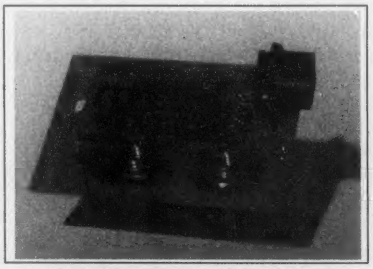

Photo B. Assembled PCB.Photo

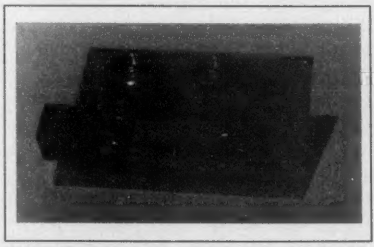

Photo D. Alternate view of assembled PCB.

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CIRCLE 22 ON READER SERVICE CARD

QSY Internet!

A wide menu of information sources.

by Al Williams WD5GNR

It seems that wherever you turn today, you hear about the Internet. Mainstream magazines, network news shows, even the local newspapers seem to be talking more and more about the Internet. You can certainly use the Internet to find out yesterday's cricket scores, or the price of cheese in 1978, but you can also find online tons of information about our favorite hobby. If you aren't on the Internet, this article will show you how to get started; all you need is some sort of computer and modem or an ASCII terminal. If you are on the Internet, read on to find out where to find ham radio-related information.

What Can I Get on the Internet?

Here's just a sample of the ham radio information you can find on the Internet:

- Callbooks
- Satellite and shuttle orbits
- Ham programs for many brands of computers (PCs, Macs, Commodores, even Amigas)
- The latest FCC regulations
- Sample examination questions
- Recent DX station spots
- Propagation forecasts
- Repeater databases
- Hamfest and club listings

And that's just the tip of the iceberg. You can even talk to other hams in real time (like a RTTY QSO) or by using messages.

> *"The good part is that it is free; ask around to find out where the nearest Wormhole is."*

How Do I Get All This Stuff?

Information on the Internet comes in many flavors. The data you want resides on a computer that could be anywhere in the world (a server). To get the data, you need to use the right protocol. The Internet supports many different protocols. Here are the most popular ones:

Telnet

When you use telnet, you log on to the remote computer directly. For example, some callbook servers operate via telnet. The initial screen indicates what user ID you use to log on. Then, the computer automatically runs the callbook search program. Your computer acts like a dumb terminal, in this case.

FTP

You use FTP to retrieve files from a remote host. When you use FTP to connect to a remote computer, it asks you for a user ID and password. By convention, most Internet computers allow you to log on as "anonymous" and supply your electronic mail address as a password. Then, you'll have limited access to public files on the host computer.

Web

The Web (or World Wide Web) is the latest word in Internet tools. A Web server stores pages of information. Each page can contain text, pictures, and even sound (see Figure 1). More importantly, a Web page contains links to other Web pages and Internet resources. A Web page on ham radio, for example, might have a link to a DX bulletin, another that runs a telnet session to a callbook server, and another that downloads a log book program using FTP. To use the Web, you usually use special software called a Web browser. You can use a simple text-only Web browser using nothing more than a Teletype. For personal computers, you can get sophisticated Web browsers that support text, graphics, sound, and even moving pictures. Most Web browsers can handle FTP and telnet, too. If you can use a Web browser, it may be the only Internet tool you ever use.

usenet

The usenet (or newsgroups) are similar to ordinary bulletin board systems (BBS). There are groups for everything from ham radio, to cigar smoking (no kidding). You can read messages from others on the subject and post your own messages. How you read newsgroups varies depending on the system your provider uses.

IRC

You can use IRC (Internet Relay Chat) to talk to other people (including hams) in real time. This is very similar to having a RTTY QSO, except there is no QRM, QSB, and TVI, the transmission is fast and error-free, and multiple people can talk at once.

The exact interface you use with these tools varies depending on your Internet provider. Figure 1 shows a typical Web page viewed with the Windows 95 Internet Explorer (a Web browser from Microsoft).

Ham Radio Resources

The Web is by far today the most important part of the Internet. Exactly how you access the Web depends on what tools you are using. Resources on the Web have a "Universal Resource Locator" (URL) that serves to identify it. You instruct your browser to "open" a URL. Then you can travel to other parts of the Web by clicking on that page's link. A URL has three parts. Here's an example:

http://www.qualcomm.com/amsat/AmsatHome.html

The first part of the URL, "http:," tells your browser that you are accessing a Web page. Other choices here are "ftp:" or "telnet:", for example.

The next part of the URL is the computer you want to use (the host). In the above example, the computer is "www.qualcomm.com." The remaining part is a file name (including a directory). The example is for file AmsatHome.html in the amsat directory.

If you aren't using a Web browser, you can still access FTP and telnet resources. Just use the host and file names with your FTP or telnet program.

The following are some URLs that are interesting to hams:

URL	**Description**
http://www.clinet.fi/~jukka/webcluster.html	Real time DX spots.
http://acs.ncsu.edu/HamRadio	Page with links to many resources (repeater database, news, tests, packet, etc.)
http://www.libertynet.org/~adam/low-pro.html	Tips on operating from apartments or restricted homes
http://canada.unbc.edu/radio/	DX, propagation, packet information
http://www.qualcomm.com/amsat/AmsatHome.html	AMSAT satellite information
http://hypatia.gsfc.nasa.gov/sarex_mainpage.html	SAREX (Shuttle Amateur Radio Experiment) page
http://www.gate.net/~rlehman	SSTV page
http://wb5fnd.tech.uh.edu/irc	Information on ham radio IRC (Internet Relay Chat)
http://ftp.cs.buffalo.edu/pub/ham-radio	Many ham radio files
http://www.tapr.org/tapr/html/pkthome.html	Packet radio information
http://www.qrz.com/callbook.html	Callbook servers
http://promet12.cineca.it/htlzh/qsl.html	
telnet://callsign.cs.buffalo.edu:2000/	
http://acs.oakland.edu/barc/arrl.htmlC	ARRL home page

Searching the Net

The Internet is constantly changing. How can you find new things? How can you find items about other subjects? The best way is to use a search program. There are several Web sites that allow you to search for Web pages or access them via an index. Two powerful search programs are Lycos (http://lycos.cs.cmu.edu) and Yahoo (http://www.yahoo.com).

If a file you want appears in a Web page link to an FTP server, you can easily find it this way. If it is only in an FTP server, finding it can be more difficult. You can use a program named "archie" to find files on FTP sites, if you know the file's name (or part of the name). Otherwise, you can connect to FTP sites you think are likely, and see if they maintain an index file (usually, INDEX or 00_index). Download the index file and search it for the file you are interested in; many index files have file descriptions in them. Remember, if you are using a Web browser, and you want to FTP files from oak.oakland.edu (for example), just open the "ftp://oak.oakland.edu" URL.

Making Contact

Before you can access these services, you need to connect to the Internet. If you use packet radio, you may be able to gain limited access to the Internet via an Internet Wormhole. However, this is slow and doesn't offer many options. The good part is that it is free; ask around to find out where the nearest Wormhole is.

To get the most from the Internet, you need an account from a provider. If you live in a metropolitan area, you may find local providers. Table 1 shows the major national suppliers. There are four common types of accounts that use ordinary telephone lines:

1. Terminal
2. Proprietary interfaces
3. Direct SLIP
4. Direct PPP

When you use a terminal account, you use a modem and a terminal (or terminal emulator) to dial into the provider's computer. Then you use tools on the provider's computer. This is usually the least expensive way to get access. You can use any computer or terminal that will work with a modem. You don't need to maintain any software, since it is all on the main computer. If you use an older computer (a Commodore 64, for example), this may be your only option. Any computer with terminal emulation software can use a terminal account.

There are many drawbacks to a terminal account, however. Usually, it is not possible to use graphical Web browsers on a terminal account. You may be able to use text-only browsers, but you lose the full impact of the Web that way. Another problem occurs when you transfer files via FTP or the Web. The file winds up on the provider's computer—not yours! You'll need to use some file transfer software (XMODEM, for example) to move the file from the provider's computer to yours, a procedure that is just like getting a file from a common bulletin board system. If you use telnet or want to send electronic mail, a terminal account is as good as any other.

Many of the national providers (CompuServe, America Online, and so forth) use a proprietary interface to the Internet. You use their software on your computer to access their service. Then, by means of a series of menus or buttons, you can access the parts of the Internet that you want. These services often offer simplified access to common services, plus they usually have other services not related to the Internet. CompuServe, for example, has its own ham radio bulletin board that is independent of the Internet. Most of the major players have interfaces for the PC and the Macintosh.

If you opt for a SLIP or PPP account, your computer becomes a full node on the Internet for as long as you stay on the phone. This is the most powerful option since you control the software on your machine. It is also the most difficult to manage. You must set up your system to use a "stack" (software that manages the connection) and maintain all the Internet software you want to use. If you are using Linux, OS/2 Warp, Unix, or Windows 95, the stack is built in and you probably have several basic tools (FTP, telnet, and so forth) already on your system. If you run ordinary Windows or MSDOS, you'll find it is quite a job to install the stacks and get them working properly.

What to Look For

When you select a provider, there are several things you should consider:

1. Cost

There are many tiers of pricing available. The most convenient is when you pay a flat fee and can use the service as much as you like. However, it may be less expensive to pay as you go. Typical flat-rate accounts run about $35 per month in the Houston area, for example. You can also get a basic account for about $10 per month. For that fee, you'll get a few hours for free each month. Then additional hours will cost $1 or $2 an hour. Many providers have a free trial offer; be sure to ask.

2. Availability of local phone numbers

Be sure that the provider has local phone numbers. Otherwise, you'll pay long distance charges. Some providers have 800 numbers, but you'll pay as much to use them as you'd pay the phone company for long distance.

3. Number of times you can use the service

Many providers offer unlimited access during nonpeak hours (evenings, and weekends). Others may surcharge peak hours or disallow access during peak times. Be sure to check if you want access during the day. If you don't need daytime access, try to get a discount on evening access.

4. Services available

If you get a SLIP or PPP account, see if the provider supplies any software (especially the stack). Otherwise, you may need to buy or find tools (FTP, telnet, a Web browser, and so forth) for your computer. Also check that the provider will accept electronic mail for you and forward it when you connect. This is essential since you are connected to the Internet only when your computer connects to the provider's computer on the phone.

Another issue is usenet. Your provider must "subscribe" to particular newsgroups for you to read them. Make sure your provider receives any groups you want.

If you opt for a terminal account, you need to be even more selective about available services. If your provider doesn't have a text-only Web browser, for example, you can't access the Web! Make sure they have satisfactory tools. The same goes for services with proprietary interfaces: What they have is what you have to use.

Many people want to put their own pages on the WWW. Some providers offer this for free, others charge a fee, and some don't allow it at all. If you want your own personal pages on the Web, be sure to ask if the provider allows it.

5. Hidden costs

Check for hidden costs: prime time surcharges, phone line charges, fees for disk storage, and so forth. If you want to publish a page on the Web, make sure there isn't an additional fee for this service.

6. Support

Usually, if you aren't familiar with computer networking, you are better off going with one of the major national providers with a proprietary interface. Their systems are easier to use, and they offer free support. Terminal, SLIP, and PPP providers expect you to know more about what to do and are less likely to offer detailed support.

Summary

With the explosive growth of the Internet, it is difficult to keep up with the daily changes. The best way to find out about the Internet is to get an account and jump right in! You'll find it a useful adjunct to your radio gear, and an interesting hobby in its own right.

Bibliography

There are many, many books available about the Internet. Here are a few to get you started:

Hahn, Harley. *The Internet Yellow Pages.* McGraw Hill, 1995. Like the regular yellow pages, this book tells you where to look for items on the Internet.

LeJeune, Urban. *Mosaic and Web Explorer.* Coriolis, 1995. If you use the Mosaic Web browser, you'll find this book very useful with information on the browser, web sites, and more. Includes a CD-ROM.

_____, *Netscape and HTML Explorer*, Coriolis, 1995.This is similar to the Mosaic book, but uses Netscape, a very popular Web browser. Includes a CD-ROM.

Pike, Mary Ann. *Using The Internet.* Que, 1995. This is a very complete book that comes with many Windows Internet tools on CD-ROM.

Vincent, Patrick. *Free Stuff From The Internet.* Coriolis, 1995. As the name says: how to get free stuff. 73

Table 1. National Internet Providers

Provider	Phone
America Online	(800) 827-6364
CompuServe	(800) 848-8990
Delphi	(800) 695-4005
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KRP-5000 Repeater shown with PA-100 Amplifier

CIRCLE 144 ON READER SERVICE CARD

73 Review

Number 41 on your Feedback card

by Stuart Landau K6YAZ

Kenwood TS-870S HF Transceiver

We are promised that conditions on the high frequency amateur bands are going to be getting better, with the startup of the next sunspot cycle. For now, the average ham, with a 100 watt station using antennas that are acceptable in an urban location, are having a difficult time working weaker stations through man-made and natural noise.

Certainly high power and large antennas will help, but many of us just can't afford to go that route. Antenna restrictions and interference to consumer electronics creates a difficult situation that we have to live with, or give up that part of our hobby. We need an edge to make amateur radio as enjoyable as possible, and I for one don't want to put off working the low bands until things improve, in a few years.

Kenwood has just released its newest and most advanced high frequency transceiver. The design feature that is unique in the amateur market (at least for now) is the use of a digital signal processor (DSP) that processes signals at the intermediate frequency (IF) as well as at audio frequencies. This has also been done recently by other companies making radios for the commercial and military markets (and their products may be purchased at great expense).

Kenwood was the first amateur radio company to design DSP into an amateur transceiver (in the TS-950 SD and SDX), and now they've expanded greatly beyond their original efforts, and they seem to have done it right! I've been able to copy signals on the TS-870S, buried in so much noise that I couldn't copy on other receivers, and that's what its all about. You can't work them if you can't hear them.

Description of the radio:

Lets start with the receiver, since it is what you would spend your time listening to, not the transmitted signal. It is a quadruple conversion type superheterodyne. The frequencies used are 1st: 73.05 MHz; 2nd: 8.83 MHz; 3rd 455 kHz and 4th: 11.3 kHz. All filters are included in the radio. The IF filtering is mainly done by the DSP. In addition to the DSP IF filtering, the radio contains nine crystal or ceramic filters located in the first three of the four IF frequencies, to act as additional bandwidth limiters. These are automatically selected by mode and operator-selected.

CW bandwidths range from I kHz down to 50 Hz in six steps. On FSK they range from 1.5 kHz to 250 Hz in four steps and on FM six different widths from 14 kHz to 5 kHz.

On SSB, slope tuning may be used, resulting in twelve different widths ranging from 1.4 kHz up to 6.0 kHz. Six bandwidths on AM complete the possibilities.

The reason that it is important to process the signal at IF instead of audio, is that once the signal has been detected, the DSP has lost a lot of the information that it requires to discriminate between noise and intelligence. For the most efficient transfer of voice or data, the receive filter must be matched to the transmitted signal, and predetection filtering is the optimum method. It makes little sense to have an overly wide bandwidth, and to attempt to make up for that by using a narrow audio filter. Certain artifacts will now ride along with the desired signal that make it very difficult to separate the desired signal from the noise.

A digital signal processor is a very specialized type of microprocessor. It crunches numbers, and in this case two DSP chips do it very quickly. In the receive mode, the analog signal is mixed down to a very low intermediate frequency of 11.3 kHz and converted into a digital stream of numbers. The DSP acts as IF filter, demodulator, AGC processor, squelch processor and—very importantly—as a noise processor. All of this occurs in a section of the radio which doesn't have any service adjustments!

When transmitting, the modulation with the exception of FM, is generated by the DSP, which also serves as a microphone AGC amplifier, voice equalizer, speech processor, VOX controller and sidetone generator. Whew!, what a busy region of the radio. Suffice it to say that this is one complex system

The DSP section of this radio consists of two Motorola DSP56002FC240 132 pin, 24 bit chips with a claimed dynamic range of 144 dB. The IF to digital converter is an 18 bit sigma-delta (also known as a one bit) A/D converter. The IF is highly over-sampled, resulting in a very quiet digital signal with a very large dynamic range.

The DSP IF filtering creates filters that have shape factors, pass band flatness, very high out-of-pass band attenuation and phase characteristics that are impossible to build any other way.

The transmitted signals are generated in the DSP, and mixed up several times to the transmit frequency, and amplified by the final amplifier unit. The RF portion of the transmitter, for the most part, is very similar to that of the TS-850S.

The frequency synthesizer consists of three phase lock loops and three direct digital synthesizers, all controlled by a CPU. A 20 MHz crystal oscillator serves as the only reference oscillator in the radio. The result seems to be a very fast, quiet radio.

Using the radio:

My approach to writing the evaluation of the radio was to ask friends of mine to use the radio, and give me their opinions. I didn't expect a consensus, but I think several opinions and observations are valuable.

While this radio is user friendly, it will require studying the instruction manual and practice to be able to take full advantage of the radio's unique features. It's not a beginner's radio. It would be a waste of money to buy a piece of equipment such as this and not be able to take full advantage of what it has to offer.

The TS-870S comes with a built-in antenna tuner and doesn't require (or will accept) any additional IF filters, all are already synthesized by the DSP. A sophisticated CW keyer is also included with the radio. It will operate from six to sixty words per minute, and emulates the K-1 Logikey. A normal key or paddle is all that's needed to get on CW. The radio will store four CW messages with a total of 220 characters. This sounds like a great feature for contesting. Options include a voice synthesizer, a digital recording system, and a high stability temperature-compensated crystal oscillator. An 8.83 MHz full bandwidth IF output is provided on the rear panel to be used with a station monitor such as the older Kenwood SM-220 or current SM-230.

DR Ulrich Rohde KA2WEH, well known for his communications books and articles in amateur publications was a consultant for Kenwood on the design of the receiver. His insistence that PIN diodes, rather than silicon PN switching diodes be used in critical spots in the receiver front end, has resulted in a receiver with great immunity to overload. He had the use of a pre-production radio this summer and the opportunity to make some sophisticated measurements. I use his results with his permission.

Phase Noise: -120 dBc/Hz at 10 kHz, -126 dBc/Hz at 20 kHz

This indicated a very quiet frequency synthesizer, resulting in a narrow transmitted noise signal, and low reciprocal mixing in the receiver.

Third Order Intercept Point: 22 dBm with AIP on.

Second Order Intercept Point: 64 dBm with AIP on.

This indicated the ability to reject interference when there are many strong signals inside and outside of the band.

Dynamic Range: 95.3 dB with AIP on, 91.6 dB with preamp on.

Ulrich said to me that he considered the receiver in the TS-870S the best currently available at its price.

The display is similar to that currently used in the Kenwood models TS-950SDX and TS-450S. It is a good-looking multi-colored display, carefully thought-out to help the operator. The only shortcoming of this type of display is that is very hard to see in bright sunlight. I've used both the TS-450S and the TS-870S in my car, and while most operators won't use this radio mobile or outdoors, it's something to consider.

Unlike all other Kenwood High Frequency radios, the front feet don't raise up. If you want the radio to tilt up to face you, you'll have to put something under the front or build a ramp. The main tuning knob now has a rubber cover around the outside and a depression on the front for your finger, but doesn't have any adjustable friction adjustment. There are two tuning rates available on the main knob, and a much faster rate using the M.CH/VFO.CH. control. I find the rate and feel to be very comfortable. Push-buttons either light up when they are in the on position, or light up an indicator on the display to indicate the state that they are in.

The instruction manual is very well-written and illustrated. The introduction and one page of the appendix explains something about the DSP and how it is used. Also included are sections on standard time stations, the NCDXF/IARU beacon network, HF beacons and the shortwave broadcast bands. The remainder of the appendix explains the digital interface for computer control (using RS-232C).

Computer Control Of The TS-870s:

The TS-870S includes a built-in RS-232C port and comes with two 3.5 inch floppy disks, containing a DOS- or Windows-compatible software program called Radio Control Program™. RCP will allow complete control of the radio via a personal computer. It will let you use or create a "virtual radio" on your screen. As long as you can provide a two way communications path at baud rates of from 1200 to 57600 bps, and audio lines, you can completely control the radio, and locate it anywhere! Optional software modules are available from DynaNet Corporation. The 870S can also transfer data (receive frequency and receive mode) to another 870S or four other types of Kenwood transceivers.

The microphone supplied with the radio is the MC-43S hand mic., the same that has been used for many years. This microphone provides up and down buttons for changing frequency or memories, but no "soft keys" as on the TS-50S and TS-60S microphone. I would suspect that most buyers will opt for some sort of desk mic.

The TS-870S is a descendent of the TS-850S. The dimensions are exactly the same and at 25 pounds weighs only one pound more. Someone comfortable with the operations of the 850 would feel at home using the 870.

At a list price of $3199, and considering the typical dealer discounts, the selling price shouldn't be much more than the TS-850S, especially if you loaded up the 850 with a bunch of IF filters.

Best points:

- The ability to survive in a crowded noise filled band.
- Many bandwidths in each mode without having to buy additional filters.
- It is also a well-thought-out contest radio. The built-in antenna switch, so that two different antennas can be used, even in the same band.
- The provision for an additional receiver to share the same antenna as the one currently in use by the 870.
- One of the features we liked most was the ability to adjust the transmit voice frequency equalization and voice processing to produce the best sounding signal for an individual voice, and to monitor the results. The reports on the air impressed many.
- It was also agreed that the noise blanker (which is adjustable from the front panel) was also very effective.
- An innovation which also received a good review was the ability to program the receiver for a very fast AGC release time on CW. When working a weak DX station being called by very much stronger local stations, the receiver would almost instantly recover from the stronger stations.
- The antenna tuner is a real improvement over anything that Kenwood has offered in the past. First it's very fast. Whether you're just changing bands and the tuner is going to a memory location or you are attempting to match an antenna, it just takes a few moments to tune and stop.

The numbers in the book don't indicate the apparent range of impedances that it is able to match. I was able to match a twenty meter mobile antenna on both 40 and 15 meters as well as the intended 20 meter band. At home, a random length dipole matched on most bands. Of course matching isn't everything, a non-resonant antenna still is usually a poor radiator, and a tuner isn't going to change that.

In another novel change from the Kenwood past, the antenna tuner may also be used during receive. This will result in greater immunity from QRM caused by strong out of band stations, and if your antenna isn't well-matched will raise the received signal strength. I had modified my TS-440S auto tuner years ago to do this, and found it be a worthwhile feature, especially when operating mobile.

The antenna tuner has 18 preset memory frequency segments. This enables you to have one setting for the CW portion of most bands and another for the phone portion. In addition you can preset either antenna connector 1 or connector 2 (ANT 1, ANT 2) for the same portions.

Frequency Bands

While the receiver covers the entire range from 30 kHz to 30 MHz, the transmitter will not operate outside of the U.S. assigned bands—not by even ten hertz! MARS and CAP modification data will be available for those properly licensed.

This radio contains a 68 item menu, which enables you to set up the radio exactly the way you want it. This also eliminates many panel or hidden controls, such as VOX, CW pitch, display dim and more. There are actually two main menus, A and B. They are the same, and may be set separately for different situations such as normal operating and contesting. You can switch between them at will. Also you can assign the most often needed menu functions to a quick menu for fast access, without calling up a main one.

When you temporarily want to return the menu to the default settings, it can be done by turning off the power, holding the CLR button and turning the power on. To return to the original settings, turn off the power and turn it on again.

The front panel meter serves up to six different functions, and consists of a multi-colored curved bar graph, that looks somewhat like a mechanical meter. An unusual feature is that the relative bandwidth and position of the pass band

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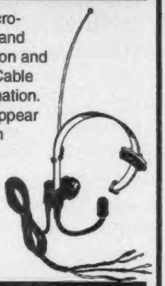

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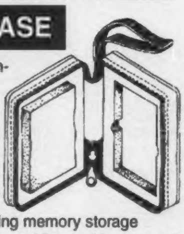

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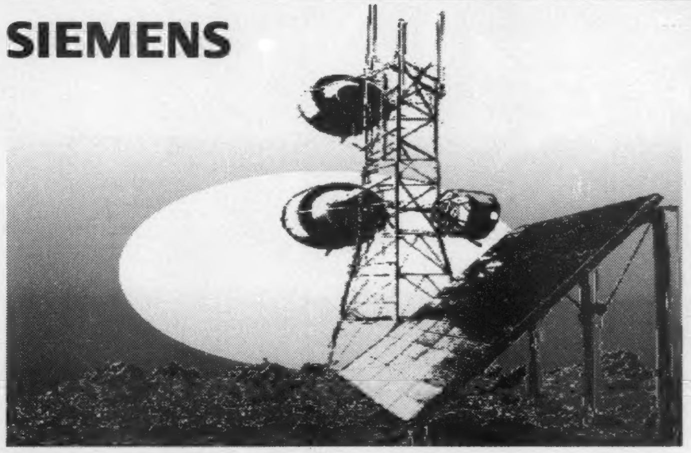

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tuning is graphically displayed. This is a really nice feature because it instantly shows how the receiver filtering is set up.

The receiver sports three new buttons which use the unique features of the DSP. The first button is AUTO NOTCH. This introduces an automatic very deep notch in the receiver IF to eliminate a heterodyne that may interfere with a SSB transmission. By doing the processing at IF rather than at audio, a strong carrier won't capture the AGC, and reduce the desired signal's strength.

The second button is called BEAT CANCEL. Used on either SSB or AM this button enables an audio notch filter that will reduce or eliminate interfering tones. This function is also more effective at removing low-level tones than AUTO NOTCH.

The third button is called NR or noise reduction. This uses the DSP on All modes except FM to improve the signal to noise ratio of received signals. A different method is used on voice modes than is used in CW or FSK. An adaptive filter analyzes speech patterns and forms a variable filter around the received signal. Kenwood calls this method Speech Processing/Auto Correlation (SPAC). On CW and FSK the preferred method is the Line Enhancer Method or LEM.

Negatives

Like any new product, some things will require time and experience to perform the best they can. The radio that I had for evaluation was a pre-production model, and some of the minor things my fellow evaluators and I didn't like may be taken care of in production:

- It will take some study and practice to master.
- The poorly contrasting display in sunlight.
- Lack of extending front feet.
- It was reported by some that the receiver audio was distorted and lacked adequate frequency response.
- The radio doesn't include a power supply but requires a separate DC power supply capable of delivering 13.8 VDC with a current capacity of 22.5 A or more.
- An internal speaker is mounted on the top cover and it sounds all right, but I would recommend a good quality external speaker or earphones for serious operating.

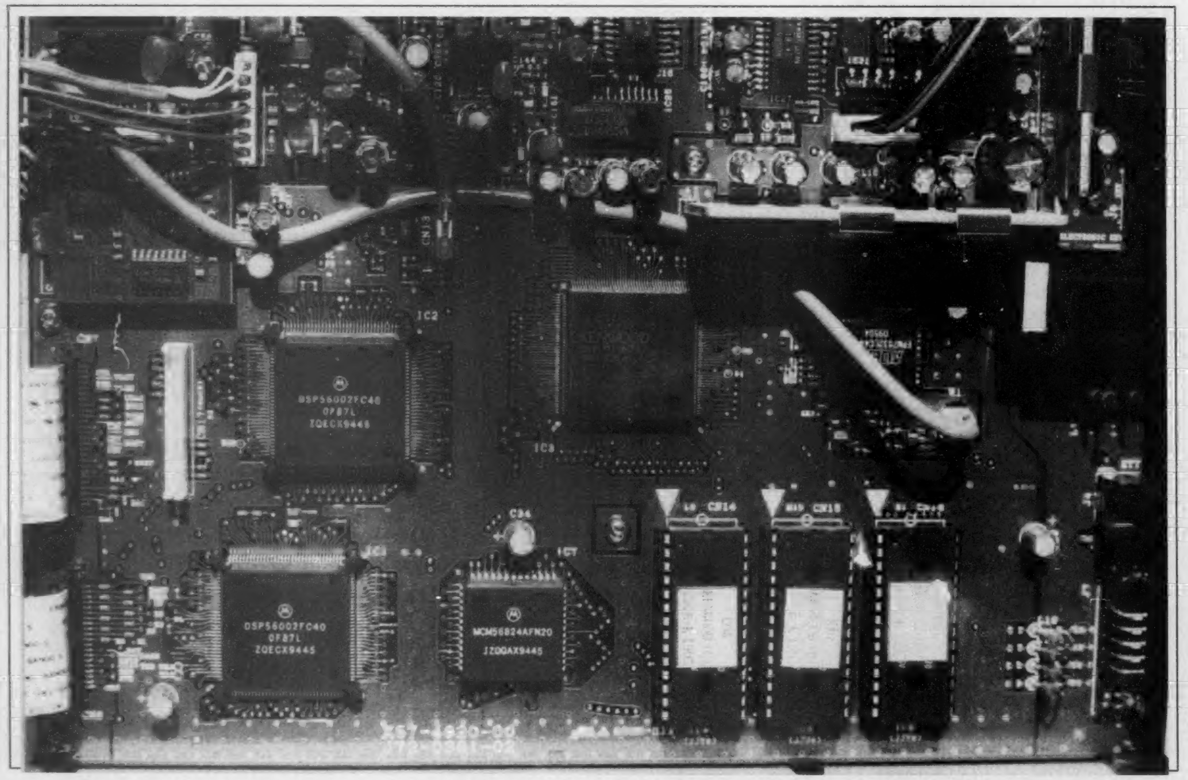
Buying a major piece of radio equipment such as the TS-870S (or any other radio) requires an informed decision on the part of the buyer. I would certainly suggest that you spend some time in front of the radio, and see if it is able to do what you want it to. What seems wonderful to someone else, may not be what you need. Talk to others who have used the equipment and then make your own decision based on your own needs, tastes and experience.

A friendly piece of advice from someone who has worked on a lot of amateur radio gear: If you have trouble with a sophisticated radio such as this, don't try to repair it yourself, and don't take it to "Mr. Fixit". There are very few service adjustments inside, and it takes special tools, a lot of experience, good test equipment as well as the service manual to make it well again. This is no place for guessing and substitute parts. 73

Biography

First Licensed in 1956 as a novice (KN6YAZ) while in Jr. High School, Stuart Landau now holds an Extra Class License,K6YAZ. He has worked in commercial television, aerospace, and communications electronics, and is urrently working as an Engineer for Standard Communications Corp., working on land mobile radio and marine electronics products.

Mr. Landau would like to thank Randy Powell, NZ6N, Al Mandel WB6RGF and Ulrich Rohde KA2WEH for their help with the evaluation. And a special thanks to the people at Kenwood for the loan of the radio along with the documentation and software. Comments to: (818) 203-2080



Inside the TS-870S HF Transceiver.

Number45 on your Feedback card

A Problem Under The Aurora Borealis

(Or, a ham's Christmas Fable from our Hamily to yours!)

By the Reinhardt Family, Jeff KM6II; Melissa KD6BIT, Jessica KD6ARA and Steven KE6PNA
(Just a little south of the North Pole, according to Steven)

In a quandry about selecting a personalized call sign? You aren't the only one. Selecting a call that's just right is a problem that reaches from your house all the way to the North Pole!

Santa found himself in a real dilemma. "This is worse than the years with no snow," he thought to himself. There before him was a blank form he had been staring at for at least two hours. "This is silly," he mused. "I'm falling behind on reading letters from the children, the elves need some assistance and supervision, the reindeer need feeding and all I can think about is this blasted form."

"Why the worried look, Dear?" Santa smiled at the voice of Mrs. Claus, which always sounded so soothing. "It's this personalized call sign thing," he replied. "I need a ham call sign that's distinctive and an identifier like no other. Ever since this has been kicked around in a few countries, it's caught on like wild fire."

"Well, why don't you get up and think on it while you do a few chores," she said, picking up a plate with but a few remaining cookie crumbs. "I'm sure the exercise will do you good, with only a few days remaining before Christmas."

Santa made his way out to the toy shop. There he encountered his busy assistants merrily working away. He asked Mike what he thought a good call sign might be. "Hmmm, how about something cute, like P1XIE?" Santa smiled. "That's a good start! Any more?" "Well, there's L1ST, which we work from, K1DS, who we work for, ST0CKG which you stuff, D0LLS for the girls, TR8NS for the boys and the G1FTS that you bring!" Santa chuckled, "All good ideas, my faithful friend!"

Thinking on the suggestions, Santa wandered over to Kit, his weather forecaster. "How are things looking for the 24th, Kit?" "Looking great, Santa, should be just right for a sleigh ride. But why so distracted?" he asked, noting that Santa's mind seemed to be elsewhere. Santa related the personalized call sign problem. Kit, an avid DX chaser, said, "No problem! In my line of work I get call sign ideas all the time!" "Like what?" asked Santa. "Well, in a few days your sleigh will make its way through the DR1FTS, and the FL8KES, the air will be FR0STY and there will be plenty of SN0W. And you remember a few years ago when it was so F0GGY? That often happens in W1NTR. Great night for one of the R8NDR as I recall!" Santa flashed a broad smile that caused his wire-rimmed glasses to rise on his nose. "Kit, you've convinced me there are plenty of good call signs to choose from. And as a citizen of the world, I can use any prefix I want!"

Kit's comment about the reindeer reminded Santa that he had to make a trip to their barn. On entering he saw Morris, a trusted helper who loved the four-legged friends. Santa asked Morris if he had any ideas on a custom call. "Well, as you know I love CW and that's why I like these reindeer. They talk to me!" "They do?" said Santa incredulously. "Indeed—listen to their hooves on the wooden floor."

Santa had always dismissed the reindeer's tapping as a restlessness to take to the night sky, but listening more closely, Santa heard some distinct calls in Morse code—"That's C0MET!" he exclaimed. "And there's D0NNR, hmmm QP1D!" he roared. "D8SHR, V1XEN, BL1TZN, D8NCR, and PR8NCR!" But a noise from the corner sent him into gales of laughter, "Oh, I couldn't forget you, Rudolph," as the hoof tapped out RN0SE. "But I can't believe you boys are so good at CW." Santa laughed again as they all tapped out SL8GH together.

He left the barn still roaring when he passed the familiar landmark, a snow-covered post in the ground, with a red stripe reminiscent of a candy cane. "By golly, I can get in the spirit of this, too," he thought. "Why right there is a good call sign, NP0LE!"

As he made his way into his office, thoughts of Christmases past came back. His mind was really working now, as he began to doodle on a piece of paper...CH1MNY...hmm, has possibilities...R0OF...no, but he smiled, remembering he would have to duck under a few antennas while up there...B0WS, maybe...B0XES, no...KR1S or KR1NGL?...one seemed to need the other...N1CK? Maybe.

He did some letter reading and flipped on his radio. After listening to one 80 meter rag-chew, Santa turned it off musing that for some of those hams C0AL might be a suitable call sign in their future! He left the office, tired but cheered by the productive evening. As he passed under the roof overhang he wondered aloud about IC1CLE as he saw one hanging there, but dismissed the thought. He made his way back to the kitchen and Mrs. Claus was humming a song. "K8ROL" he said to himself. But Mrs. Claus heard him and said, "Still working on that call sign thing, dear?" "Yes," he said. "And I've had some splendid suggestions, but I still haven't heard one that really does it for me." "Well I've had some ideas, too. Care to hear them?" "Of course my love." She handed him a plate and a glass of milk." On the plate there's one of your favorites, CO0KIE. Eat too many and you'll be R0UND!" "I already am!" They laughed together.

Mrs. Santa then showed a dreamy look in her eyes, "How about N0EL?" Santa smiled warmly, "That's closer, he said." She continued, "There's always J1NGL; how about H0LLY? No? Or the many J0YS you bring? And remember, G1VER is you down to a dimple," she said. "J0LLY describes you well. And let's not forget the S0OT I have to get out of your clothing!" Santa laughed aloud and he said, you've done it my dear!" "S0OT?," she inquired? "No, you have me laughing...he walked over to the license form and filled out H0HO on the first request line. "They should know me all over the world by this one!" They hugged and both reflected on the beauty of laughter and giving and how they fit together so well.

(The authors apologize if any of the aforementioned call signs are already in use, but remember, Santa was only brainstorming. And if one of the calls is yours, how lucky you are! Merry Christmas!)

Number 46 on your Feedback card

Nikola Tesla, The First Radio Amateur

And the real inventor of radio

John Wagner W8AHB

Nikola Tesla was born in 1856, and by the time he was 26 he had invented the rotating magnetic field principle. This discovery made possible the generation and distribution over long distances virtually unlimited electrical energy in the form of 60 cycle alternating current. This included the invention of the ac generator, the ac motor, and the transformer.

He then moved on to explore the world of high frequency phenomena. By 1890 he had conceived his famous "Tesla coil," still used as a major component in numerous electronic devices. By 1893 he had conceived, explained, and demonstrated the "four-tuned circuits," using the theories of Maxwell and Hertz for the transmission of intelligence. The circuits were tuned to resonance with each other, two on the transmitting side and two on the receiving side, using a Geissler tube detector. His apparatus used the first antenna, as well as a ground connection, plus an antenna-ground circuit containing inductance and capacity. Yes, he invented the tuned circuit! In 1893 he made the first "wireless" transmission before the National Electric Light Association in St. Louis, and it is this essential understanding that exists today in all modern radios. These principles served as the foundation for his U.S. patents that eventually had priority over Marconi's basic patents.

NIKOLA TESLA

Most amateurs are unaware of what happened June 21, 1943, when the United States Supreme Court made a landmark decision that essentially settled the long dispute between Marconi and Tesla. The court's decision on Case No. 369, identified as "Marconi Wireless Telegraph Company of America vs. United States," rendered invalid Marconi's basic patent No. 763,772 dated June 28, 1904. Tesla's patent No. 645,576 of March 20, 1900, and its subdivision patent for apparatus No. 649,621 dated May 15, 1900, had priority. The court also cited John Stone's patent No. 714,756 dated December 2, 1902, incorporating greater tuning selectivity, and Sir Oliver Lodge's patent No. 609,154 dated August 16, 1898, providing variable inductance tuning.

The following definition served the Supreme Court well because it was then able to render a just decision: "A radio communication system requires two tuned circuits each at the transmitter and receiver, all four tuned to the same frequency." It is this "four-tuned circuit invention" that Tesla patented. This enabled the high court to give him priority for these necessary basic elements of "wireless," without which there would be no foundation for future advancements.

Most historians tend to attribute the birth of radio to the early technologists who made the first refinements, but it was Tesla who had laid the foundation. Historians also give great praise, and

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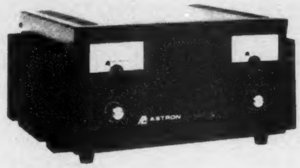
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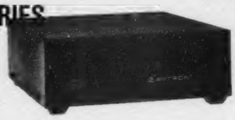

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SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

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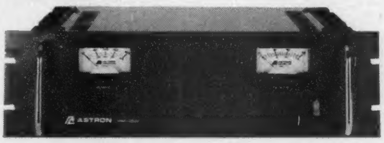
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES


MODEL RM-35M

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MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

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MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

correctly so, to such men as Maxwell and Hertz for their monumental work in wave theory. Unfortunately, Tesla's greatest contributions, AC power distribution and fundamentals of radio have largely been forgotten.

It is easy to understand why so many people have a distorted understanding of just who was the real inventor of radio. The newspapers hailed Marconi's first successful transatlantic radio transmission; then textbooks followed with their depiction of that exciting event. Both media sources had already raised the flag of victory for Marconi, much to Tesla's dismay, since he had done much of the pioneering work.

A similar media blitz is responsible for Thomas Edison becoming a familiar household name. In reality Edison did not create or develop our system of alternating current electricity. Indeed, he fought its adoption bitterly, choosing instead to promote a direct current system that had already been invented by others. In short, Edison's brief role in the electrical power industry was that of an entrepreneur who failed, rather than an inventor. It was Nikola Tesla's discovery of the rotating magnetic field principle in 1882 and patented in 1888 that gives us our modern day system of electrical power distribution.

In 1988-89 my students commissioned a bust of Tesla to donate to a large museum (any large museum). After discovering that the Division of Electricity and Modern Physics section of the National Museum of American History made no recognition of Tesla, we offered our bust. The curator promptly refused the offer, stating that he had no use for it. Later we discovered that he was displaying a bust of Edison alongside Tesla's induction motor. He also displayed photographs of the Niagara Falls power plant next to one of its original generators. A large brass inscription plate listed Tesla's patents, but with no mention of Tesla. In the middle of the display stood a life size replica of Edison with the caption, "While the Niagara AC plant was being built by Westinghouse, Edison was busy with other important things." The caption did not explain what these "other important things" were, nor why this was relevant to the Niagara power plant.

The *Smithsonian Book of Invention* is a prodigious 3/4 inch thick book of America's greatest inventors and their inventions. Tesla's name does not appear anywhere in that publication. One wonders how such an august institution, with all the learned historians in their employ, could possibly ignore Tesla's contributions in their chapters depicting the evolution of electric power and radio.

Further evidence of history being rewritten is seen in the Smithsonian's publication, "The Beginning of the Electrical Age," which meticulously traces the history of electricity from Volta to Edison, naming 43 significant contributors, and yet Tesla's name is never mentioned! Instead, it shows pictures of the Niagara Falls Power project with the inference being that this was the work of Edison. Yet it was Tesla's polyphase AC system that the power commission adopted and licenses had to be issued to use Tesla's patents. Since the money for this publication came from the Thomas Alva Edison Foundation, perhaps this explains why Edison's name and pictures appear so prominently and Tesla's name is missing. History, it appears. is indeed for sale at the Smithsonian.

Radio amateurs especially should take exception to the flagrant disregard for truth in history that exists in the Division of Electricity and Modern Physics section of the National Museum of American History, within the Smithsonian Institution. Why does the Smithsonian have such a biased view of electrical history?

Tesla's induction motor, using his rotating magnetic field principle, provides us our worldwide system of alternating current electricity. Few people realize the earthshaking importance of this discovery. Honored engineers have ranked it the electrical equivalent of the wheel.

Niels Bohr in 1956 stated, "Tesla's most ingenious inventions and researches have been fundamental for that development which so deeply influences our whole civilization."

Dr. W. H. Eccles, in the *Proceedings Of The Institution Of Electrical Engineers*, stated, "Tesla was the greatest electrical inventor we have had on our roll of membership; in fact we might go as far as to say that he was the greatest inventor in the realm of electrical engineering."

John Stone in 1917 stated, "Among all those, the name of Nikola Tesla stands out most prominently. Tesla with his almost preternatural insight into alternating current phenomena that has enabled him some years before to revolutionize the art of electric power transmission through the invention of the rotary field motor, knew how to make resonance serve, not merely the role of a microscope, to make visible the electric oscillations, as Hertz had done, but he made it serve the role of a stereopticon. He did more to excite interest and create an intelligent understanding of these phenomena than any one else, and it has been difficult to make any but unimportant improvements in the art of radio telegraphy without traveling, part of the way at least, along a trail blazed by this pioneer who, though eminently ingenious, practical and successful in apparatus he devised and constructed, was so far ahead of his time that the best of us then mistook him for a dreamer."

Lord Kelvin in 1896 stated, "Tesla has contributed more to electrical science than any man up to his time."

Tesla was recognized by his peers, but then largely forgotten.

Tesla died in 1943, alone in his hotel room at the Hotel New Yorker, surrounded by a world of technological progress he was instrumental in creating. Yet the only monument to his memory in our country is a statue at Niagara Falls, a gift from the former country of Yugoslavia. He is one of only two Americans honored by the International Electrotechnical Congress in Munich. In 1956, the unit of magnetic flux density in the MKS system was designated the **tesla**. Thus, his name is alongside only fifteen others such as Volta, Faraday, Ohm, Watt, and Ampere. Joseph Henry is the only other American so honored.

For those who are old enough to remember, the Smithsonian Institution carried on a similar feud with the Wright Brothers that lasted 45 years. It was not until December 1948, after we had entered the jet age, that its officials finally relinquished their demand to honor Samuel P. Langley, whose plane did not fly. He was Secretary of the Smithsonian in 1903, when the Wrights flew their plane at Kitty Hawk.

At best, I hope to build enough support from the amateur radio community to petition the Smithsonian officials to honor Tesla. Certainly there is overwhelming evidence that he has earned his place in history in our country's premier museum. At the very least, this issue might stimulate some lively discussions on the ham bands.

Note: *Tesla was, in my estimation, the single greatest genius in history. In addition to inventing electricity as we know it and laying the groundwork for radio, Tesla also invented the electric clock, the loud speaker, the fluorescent lamp, and a long list of other firsts. At a time when the text books were claiming that voice could never be transmitted by radio, Tesla was planning a world radio broadcasting system, and was building a tower on Long Island to transmit free electric power. The electric companies, seeing this as a serious threat to their making and selling electricity, got together and put Tesla out of business. Please help put pressure on the Smithsonian to recognize this incredible genius.—Wayne.*

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HAM TO HAM

Dave Miller, NZ9E
7462 Lawler Avenue
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Two months have passed now since we inaugurated this column within the pages of *73 Amateur Radio Today* magazine. Input from you, the reader, has begun to materialize, but we still need a much more enthusiastic response in order to fill this space with the very best of information that's available. We're looking for tips, ideas, suggestions and techniques that will help our other readers in their pursuit of amateur radio. Whatever you feel might be helpful, things that you've discovered in your own ham career that have proven worthwhile, both technical and from an operational standpoint. Everyone has something to contribute, the key to unlocking the idea for the rest of us to share is to sit down and write to me about it. Make your point as clearly as you possibly can, including all details, schematics, sketches, etc. Whatever you feel would be helpful to get your point across to others. One of the secrets to making sure that your written suggestion clear, is to have a friend read it over first, preferably one who's not familiar with the idea. If he has any questions, then you'll know what else you'll need to include for best clarity. We're looking for workable, proven ideas and suggestions, ones that will be repeatable by others with the same or similar problem and ones that haven't been published elsewhere. Send your contributions to:

73 Magazine's Ham To Ham column

c/o Dave Miller, NZ9E

7462 Lawler Avenue Niles, IL 60714-3108

For each idea used within this column, Uncle Wayne will send you ten real U.S. dollars for your time, trouble and postage costs, but the real satisfaction is in knowing that you'll have helped others benefit from your experiences and knowledge.

If you've sent in ideas and suggestions to other publications, only to be ignored or forced to wait for months—years?—to even receive a response, I can guarantee you that it won't happen this time. I'll acknowledge all legitimate contributions expeditiously, giving the contributor an idea of whether his or her idea will be used, and roughly when. Nothing turns people off more quickly than to have their ideas and suggestions viewed with indifference...I know...I too have been ignored at times by other publications. I promise you that it won't happen here, it's one of the reasons that I first contacted Uncle Wayne about starting this type of column in the pages of

73. We need a place where good ideas are valued enough to be treated respectfully, and this is it.

There are tons of good ideas out there. With all of the equipment now available to the average ham and all of the different and varied modes of operation, any number of problems and their solutions have to have been discovered by Joe or Jane average ham. These are the ones I want to hear from. The dyed-in-the-wool engineers and contemplative theoretical physicists are welcome to send their thoughts, ideas and drawn-out treatises to the other magazines. We're looking for real hams with solutions to real ham-related problems, within the down-to-earth context of our hobby. As the masthead says, Ham To Ham, not physicist to physicist or theoretician to theoretician.

By the way, I've no problem with engineers, physicists or theoreticians particularly, it's just that I don't think that most other hams are really all that interested in long, boring soliloquies on concepts that can be explained much more succinctly. Brevity in explanation is often the key to understanding; it's surely the key to staying awake after a long day at the salt mines while you sit back and read the latest issue of *73*. Not everyone who reads a magazine like this one, or who holds an amateur radio license for that matter, is an engineer, nor may they be involved whatsoever in the electronics profession on a day-to-day basis. I've the feeling that most of the folks who might be reading this just want a straight-forward solution to a perplexing problem within the hobby, and that's where this column is heading. If this is vastly different from your own interests in the pursuit, try to step back and view it from that perspective. Now, if what I've said is already your viewpoint, or you can at least momentarily make it your viewpoint, then sit down and write about some of the things you've run into with commercially made equipment, antennas, station accessories, etc. and send them in to me. Knowledge is only usable if it's in understandable form. *73 Magazine* has always had the reputation of being a practical showcase for real hams, with real, duplicable ideas and articles. Let the others print things that no one wants to read, build or do, we'll stick to actual reality, not virtual reality.

When you do contribute ideas to this column, however, please try to be fair to the manufacturer of the item if you have a suggestion for an improvement Everything ever made can be improved upon. Equipment manufacturers often sacrifice one feature for another, or they may drop something because of cost and competitive design reasons. We're usually wrong if we consider everyone other than ourselves to be fools! We're also definitely not looking for unsubstantiated complaints nor libelous accusations about any particular manufacturer or company. That's not the purpose of this column. Our purpose is simply to help others who might be experiencing the same or similar problem with a piece of gear, with the thought in mind of fixing the problem, not fixing the blame for it.

Anything in and around the ham shack is open for acceptance on this page. We're all involved in electronics in general, as well as in amateur radio specifically, so consider sending in ideas that may not seem solely for use in ham radio—though I do want to keep the main focus along the ham equipment lines. In fact, my first tip this month is something that reaches beyond the ham shack and into the world of TV's, VCR's, etc. as well.

A Simple Infrared Control Verifier

Some of the current ham gear is showing up with infrared remote control capabilities, just like the vast majority of new TV sets, home VCR's, stereo audio setups, etc. Infrared headsets and microphones have also invaded the ham shack in the interest of keeping desktop cable clutter to a minimum.

Here's a simple way that you can verify if your hand-held infrared remote transmitter is at least putting out a signal when a button is depressed, since our eyes can't see an IR beam of light directly. By the way, many of the problems with infrared remote controls can be traced to a faulty hand-held transmitter unit. Either a button(s) not making good contact, dead batteries or batteries making poor contact or a cracked PC board from one too many drops on the floor! But to test it, all that you really need to do is to tack an IR detector diode across the input of any high-gain audio amplifier, turn up the amplifier's volume, aim the remote transmitter at the diode's face, and you'll be able to hear the pulses being sent out by the IR transmitter. That's it.

Any high-gain audio amplifier that's usable down to microphone levels should work—such as the Radio Shack #277-1008 portable battery operated test amplifier. The IR detector diode can be one-half of an infrared emitter/detector set, such as the IR detector diode in the Radio Shack #276-142 combo. Even a glass encased 1N914 or 1N4148 silicon switching diode can be pressed into service, but it's much less sensitive than a real IR diode—did you know that all glass-encased diodes are somewhat light sensitive? They're temperature sensitive too, but the ones specifically made for light or temperature sensing are specifically formulated to enhance those particular properties.

Painting Antennas

I can remember overhearing a conversation on the ham bands one day—between two fellow hams who seemed to know each other fairly well—on the virtues and drawbacks of painting a new 2-meter vertical antenna that one of them was planning on putting up soon. The one putting up the new vertical asked the other if he thought that painting his new antenna, to help preserve it, would be okay. The second ham

Continued on page 66

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RG58A/U 95% TC BRAID	.17/FT	.15/FT
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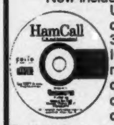

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More Amplifiers

Last time, we were discussing the buying and setting up of an HF linear amplifier. Let's continue:

OK, so you picked one and bought it! If it's new, you're substantially poorer but plenty happy, because you can be pretty sure it'll work. If it's a used amp, either you've seen it work or, like me, you took a chance, hoping the seller was honest when he told you it was a wonderfully operating bargain. Let's find out!

Hook It Up

Connecting an amplifier to your radio can be simple, but it isn't always. Sometimes there are obstacles. For starters, where do you put the big beast? I recommend that you don't put it right up against the radio. Why? Two reasons: heat and RF feedback. Amps really get quite warm in operation, especially if you use them in some continuous-duty-cycle mode like RTTY or SSTV. Do you want all that heat going into your radio? Aside from possibly shortening the rig's life, the extra heat may very well cause the radio to drift noticeably, even if it's a modern, digitally synthesized model. The reference oscillator, although crystal-controlled, can drift thermally enough to cause the radio to slide a bit. Heck, some smaller HF rigs drift a little from their own final amps' heat!

The second issue is more immediate. No matter how well grounded your station is, that amp will throw some RF, and it can glitch your rig something fierce, causing everything from screaming audio feedback to "permanent keying"; you may have to turn the radio or the amp off to get it out of transmit! Besides, if your station is like most, it probably doesn't have an ideal ground, exacerbating the situation. There are two things you can do, besides getting a really good ground, to help avoid the RF feedback blues. First, keep the amp a good foot or more from the radio. Second, line up the equipment so that the antenna lead goes from the radio, to the amp and out the window without crossing back near the radio. In other words, put the boxes in a line, from rig to amp to window. In some marginal grounding situations, like the one I used to have when I lived up in Vermont, that can really make a difference. I remember that, when I tried it the other way, with the amp's output coax going back behind the radio, it went nuts. When I put it all in a line, it worked fine. Hey, it even rhymes!

> **"You may've heard horror stories of people having to use tuners between solid-state radios and older amplifiers."**

Wire It Up

Now that you've selected your operating layout, it's time to connect it all up. Obviously, the radio's antenna coax goes to the input of the amp, and the antenna goes to its output. If you have an antenna tuner rated for less power than your amp puts out, ***don't*** put it at the output of the amp, even if you intend to leave it in the bypass position; chances are, you'll fry it when you tune up the amp. The switches and connectors in small tuners aren't intended for such service, and they may arc or melt down when you hit 'em with the juice. Until you've actually put out 500 or more watts of RF, you have no idea what it can do; it behaves very differently than when you run 100 watts. It's perfectly fine, though, to put the tuner between the radio and the amp's input, although actually using it with the amp turned on can complicate the tune-up procedure.

With older radios, you can usually connect the relay output directly to the relay on the amp. With newer sets, though, there may not be enough current to drive the amp's relay without damaging your radio! That's especially true when you use a newer radio with an older amp, as many of us do. There are several ways out of this predicament. First, if your radio's manufacturer offers a relay box, you can simply buy it. Or, you can make your own. To do that, see my article entitled "Key It" in this issue, or design your own relay circuit, always keeping in mind the current limits of your radio, which should be stated in the manual.

If your amp has an ALC input, connect your radio's ALC output to it, using a shielded cable. Usually, the ALC output is present on an accessory connector, somewhere near the relay output. A good audio cable will do fine here. Do you really need to use ALC? No, but it sure helps you avoid splattering all over the band, which is quite easy to do with an amp, particularly if your radio is, like most, lacking an RF power output control for SSB. If you're depending on the rig's microphone gain control to keep things under the drive limit, you're pushing your luck. If, though, either your radio or amp has no ALC connection, you can still use them with each other. Just be careful not to overdrive the amp, or you may have to look for that little pink slip in your mailbox, or, at least, accept the wrath of all those people on the band who don't appreciate being splattered on from 20 kHz away!

Most amps and radios use negative-going ALC which ranges from zero to about -5 volts DC. Usually, you can just connect the cable and go. Some, though, use an oddball arrangement, with positive voltage or another voltage range. If you can't get your amplifier to put anything out, try disconnecting the ALC line. If that brings it back to normal, you either have an incompatible setup (in which case you'll have to run without ALC), or your amp may have an ALC adjustment you need to do to get it working properly. If that's the case, follow the manufacturer's instructions. If you don't have them, turn the amp's ALC pot wide open, tune the amp into a dummy load with the rig sending a carrier at full output power (as long as it doesn't exceed the amp's limits) and then turn the pot down until the output just starts to fall. That ought to do it. Just remember to do all this quickly, because very few amps can stand putting out full steady-state power for very long.

Don't forget the ground! With all that RF floating around, proper grounding is even more important than it is with a lower-power setup. Most of my problems with amplifier operation have been due to poor grounding, which causes horrendous RF feedback, essentially wiping the rig out so badly that it's useless. The best arrangement is a "star" ground, in which the rig's and amp's ground terminals are connected with braid to a common ground point, preferably an outside rod. Although a "serial" ground, in which the braid goes from the rig to the amp and then to the ground, can work, it can also cause RF feedback, so it is not a great idea. And ***never*** run the braid from the amp to the rig and then to ground—that's just asking for lots of RF energy to get pumped back into the radio.

Rock and Roll!

You should be ready to give it all a try! If you're lucky, you can just feed carrier into the amplifier, tune it up quickly for maximum output consistent with a plate current dip, and yack away. If it doesn't work properly, though, there are some things you can try.

Before we go on, there's something I must say: Please, please exercise extreme caution when opening your amplifier or working near its antenna. ***Never*** open the amp with the power plugged in, and always discharge the anodes to the chassis before you go near them. The high voltages inside an amp will easily kill you, and so will the amp's RF output. It has happened to a few pretty experienced hams who got careless and ignored the rules. Nothing in this hobby

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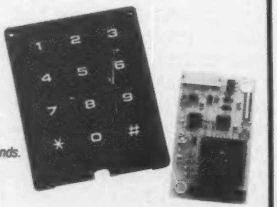

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is worth dying for! With that in mind, let's take a look.

I Get Zip

No output? If you don't hear the amp's relay pulling in when you key the microphone, something's wrong with your relay circuit. Check it out. If you do hear the relay but don't get any output, try disconnecting the ALC line, as I mentioned above. If it still doesn't work, something may be wrong with your amplifier. First, is the radio putting power into the amp? If you see very little power going in, even though you've got the rig set for full carrier output, chances are a problem in the amp is keeping the SWR at the radio so high that the rig is backing off its power to protect the final transistors. An SWR meter between the rig and the amp will tell you the story. Don't expect 1:1 SWR. But, if it's more than about 2:1 and it never dips as you tune the amp, something's wrong.

> ***"...we're gonna be up here all day!"***

You may've heard horror stories of people having to use tuners between solid-state radios and older amplifiers. It is true that many older amps don't have tuned input circuits (not all newer ones have them either), but they should still exhibit an input somewhere near 50 ohms, unless there's a problem. My amp has no impedance matching network (there is one indicated on the schematic, but a look inside the amp reveals a direct connection to the tubes' inputs via a capacitor), and its SWR is about 1.4:1. So, what could cause the impedance of an amp to change so much that it would make the radio back off?

Usually, bad tubes. Where do you think the 100 watts you put into your amp goes? If it all stayed in the amplifier, those tubes would melt down! Some of that power goes out the antenna, along with the amplified signal. When the tubes don't emit sufficiently, the path through the tube presents a much higher impedance, making the amp's input impedance rise quite a bit—the signal has nowhere to go. When I got my amp, the tubes were DOA, except for the filaments, and the SWR was about 5:1. Ouch! A working set of tubes reduced the SWR to its perfectly acceptable 1.4:1.

Another place to look is the antenna relay. Thanks to all that RF power flowing through them, the relay contacts can really get crudded up. Both of the amps I've owned have required relay cleaning, using a burnishing tool. No contact, no signal.

If you do get some output, but not nearly enough, chances are your tubes are weak. Unlike transistors, tubes can work at various levels of performance. Again, look for raised input SWR. Also, check that the filaments light on all the tubes! Multiple-tubed amps run the tubes in parallel, and will still work at reduced performance even if one or more of them is as dead as the proverbial doornail. Like the old saying goes, "If that last engine goes out, we're gonna be up here all day!"

Finally, if you're sure the tubes are good, set the amp's meter to its plate voltage scale, key the amp with no signal input and see that the high-voltage power supply is working. Don't be alarmed if the reading is as much as a couple of hundred volts off from the specified value; not only are those meters not very accurate, but the exact high voltage will depend on your AC power's voltage, which can vary enough, from region to region and even by time of day, to cause a significant change in the high voltage reading. Remember, the high voltage is multiplied from the incoming AC. So, if your plate voltage is supposed to be 2500 volts, and the amp is running on 120 volts, that's a step-up factor of about 21. If the incoming power drops by, say, 10 volts, that's a 210-volt difference in your reading. Still, if your expected 2500 volts reads 900 volts, the high voltage supply isn't working properly, and may have a bad diode or other failure.

Well, that ought to do it! You should be on the air, loud as can be, with a nice, clean signal. Until next time, 73 from KB1UM.

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Well, this is the time for all jollity and merriment as Christmas approaches. I hope you and yours are all enjoying the holiday seasons. Here in California, "seasons" are usually defined by two, the rainy season and the sunny season. In the summer it's *too* hot, and in the winter it's somewhat rainy. This year the rainy season lasted unusually longer into a normally dry month of July. I envy others that are able to enjoy four seasons. Have a merry Christmas and a happy New Year.

This month I want to reflect on several aspects of making your project VHF/UHF converters resistant to destruction, or, "Make It Bullet-Proof." What I mean is having a construction technique that embeds some safety measures in it's design to allow a margin of error, or happenstance factor. Having this factor built into, say, a microwave converter will give a you some very valuable protection to your mixer circuitry. This one device seems to take the brunt of punishment from a converter standpoint. The mixer is the one device that interfaces directly with the IF system of a two meter or other transceiver and could be keyed directly into by the transceiver when an IF switching circuit malfunctions. The effort here is not to make the simplest system that will function, but one to which some protection circuitry is added to protect your equipment as much as possible.

We all have used the breadboard construction technique to experiment with different circuits of interest. This method is time proven but has several drawbacks, especially when we go to place the bench-tested breadboard circuit into operation with a quick "wanna see it work" attitude. This is not a problem for a quick test, but further cleanup of circuitry and housing problems remain that must be dealt with before the circuitry can be called reliable. It may test just fine on the bench, but when connections and cables are moved about there will be lots of intermittents and other disparaging problems. We need to increase the circuit's "survivability."

Not to worry. What you are seeing is the birth of a finished product. It does not have to have a machine-milled cabinet with inlaid labeling. All it has to have is a reinforced back plate for connections and some type of metal enclosure to shield the respective circuitry contained inside. What comes to mind, in the simplest form, is the use an aluminum chassis upside down to mount all components internal to the chassis. Construction is usually limited to minimum holes drilled in the chassis to mount parts and circuit boards. The back board cable entry is especially nice in comparison to loose clip leads and other cables run about the test workbench. This pile of spaghetti has become tangled and even set the stage for a set of trip wires that have sent parts flying. It has happened to me and only cleaning up our act improves this operation. Now that our house is in order, let's get on to the meat and potatoes of this month's column.

Construction of a microwave converter, while not intended to be expensive, does contain some hard-to-locate components. These can be modified devices and home-constructed amplifiers; however, one component still eludes our grasp for home modification or construction: the microwave mixer. Suitable mixers have been constructed for the lower microwave frequencies, but for a 10-GHz mixer, this one item, the commercial mixer, is considered "Rarium" or, as I usually say, "Unobtainium." Well, they are obtainable but very precious. This circuit I am about to describe is designed to protect them from key up power transients from the IF source a two meter radio.

As you know, the mixer only needs about 10 dBm of power to function properly from the IF device (usually a 2 meter radio), while the 2 meter radio is capable of powers far in excess of 10 dBm. Most HTs will provide 2 to 5 watts of power while other rigs are in the 10-watt class. The problem is that, in receive, the mixer circuitry needs to be connected as direct as possible without attenuation to the receiver circuits of the 2 meter radio for best receive performance. While in transmit, the output power of the 2 meter radio may be operating at reduced, low-power ranges. It still needs to be attenuated down to the +10-dBm range to prevent mixer burnout.

The worst scenario possible, even after taking care of proper relay-switching circuitry, is to have the relay fail to operate, and having the low-power (usually 1/2 to 2 watts) key full into the mixer. See Figure 1 for a basic switching circuit. Note that if the relay fails to operate, the full RF output of the IF radio is applied to the mixer. This is usually always "fatal" to a mixer, and we term it rear-end mixer blowout. Now, when this is your precious, one-of-a-kind mixer, what can be done to prevent your mixer from being toasted from excessive RF?

The North Texas Microwave Society a few years ago came up with quite a clever protection scheme—a circuit improvement to the scenario shown in Figure 1. They placed an amplifier and attenuator in the receive path, effectively blocking high-power RF from a direct connection between the mixer and the 2 meter radio. A single Microwave Miniature Integrated Circuit (MMIC) amplifier like a MAR-1 is used for the amplifier. It has about 10 dB of gain and is followed by a 10 dB-attenuator making the entire circuit *zero gain.* That is, the gain of the amplifier is offset by the loss in the attenuator pad.

If for some reason the switching relay fails to operate, and the transmitter is keyed into the receive path of the mixer circuit with this configuration in place (Figure 2), two things happen. First, the power of the transmitter is attenuated by the receiver amp output attenuator, reducing power through the pad. Second, this reduced power from the 2 meter IF radio is applied to the output circuitry of the MAR-1 MMIC amplifier, further reducing power through the MMIC (backwards) to the input circuit of the MMIC amplifier and on to the mixer.

Bench tests show that, even when 10 watts were applied to the circuit to test for immunity to high-power RF, the above circuit did not fail. As predicted the power was attenuated by the attenuator and the MMIC survived this high-power surge.

This excessive power was not kept on for a long test period as the 10-dB pad which was constructed out of 1-watt resistors, would not have stand a long transmitter key up. They will take abuse for a few minutes or less, easily. It is hoped that you have quickly recognized your switching problem due to your station's

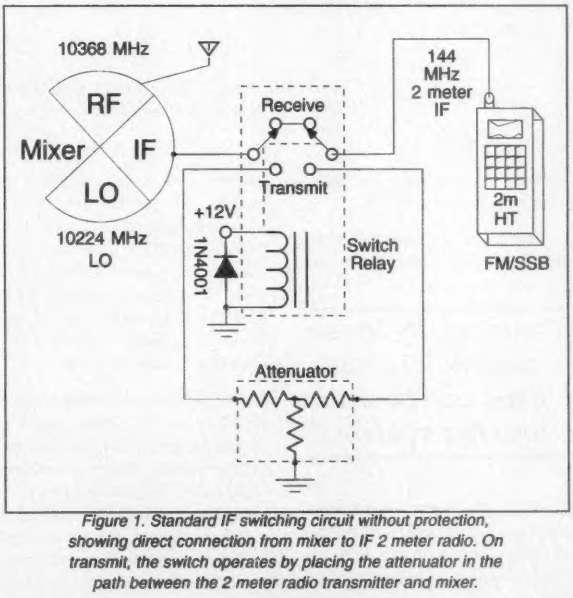


Figure 1. Standard IF switching circuit without protection, showing direct connection from mixer to IF 2 meter radio. On transmit, the switch operates by placing the attenuator in the path between the 2 meter radio transmitter and mixer.

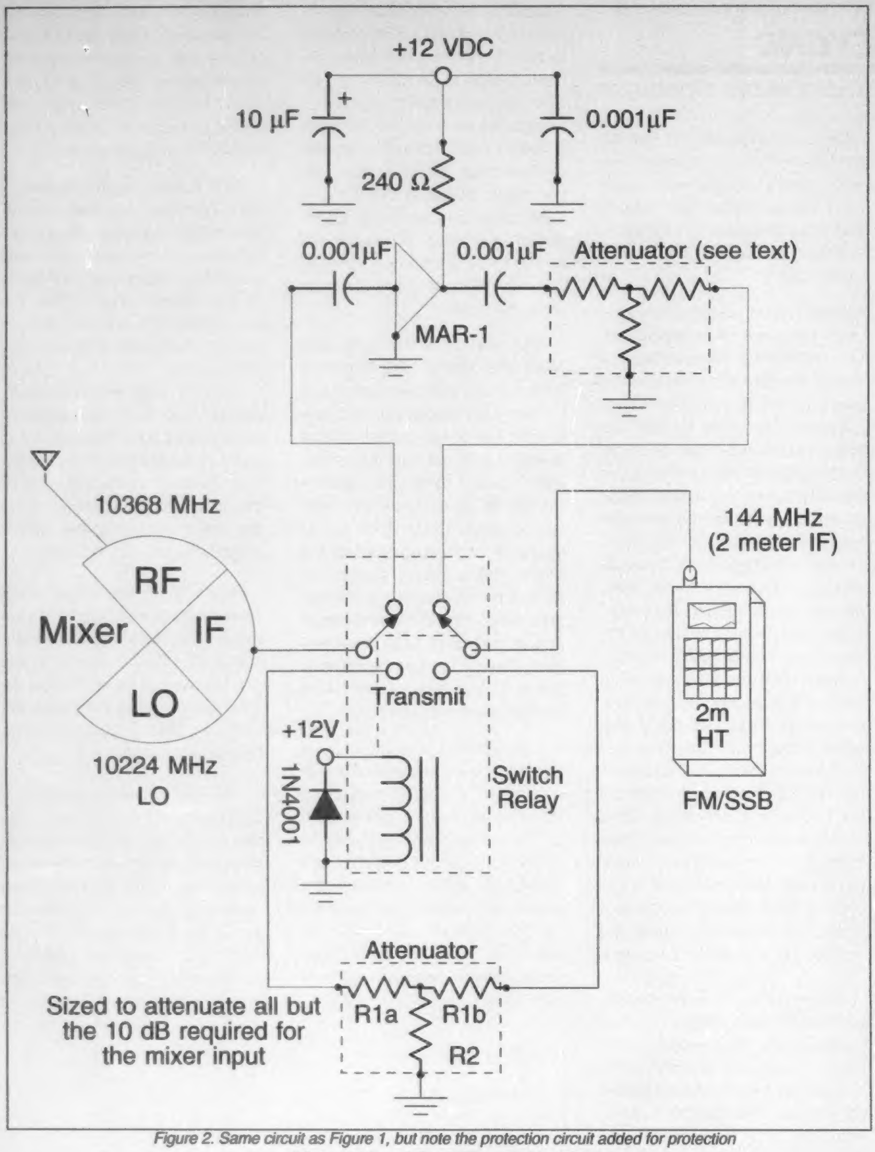


Figure 2. Same circuit as Figure 1, but note the protection circuit added for protection of the mixer from failure of the switching circuit.

failure to transmit, and have begun to investigate.

The protection circuit, at worst, will destroy the pad or attenuator and not the mixer. This should happen only on very long key ups. Normal operations preclude the long key ups except for beam heading alignment, where transmitters are put on the air for several minutes at full power. Normally contacts are quite short and the circuit can survive many such short, attempted contacts. The best part of this circuit is that the remedy is quite inexpensive, compared to a new mixer.

> ***"Just verify these parameters and fixes can be built into the system."***

The MAR-1, or similar MMIC, costs in the $1 range, and the output receive attenuator can be made up from 1/2- to 1-watt resistors with several resistors paralleled to make the specific pad value required. By using several resistors, the power handling capability is increased to several watts continuous. It will stand the full 10 watts for a short interval. Resistor pad values will have to be adjusted to suit your requirements. The 10-dB pad is used with a reduced power driving source of 100 mW. If your IF power is higher, the pad value will have to be increased accordingly. For 10-watt rigs operating on full power, you will need a pad loss of 30 dB.

Most mixers require driving RF power of about +10 dBm, so with 10 watts (10 watts in dBm = 40 dBm), a 30 dB pad or attenuator is just right. When using pads for this power level make sure that the pad resistors can handle this on a continuous basis. Don't skimp here, as using an underrated pad is just as dangerous as the receiving switching key up troubles. I suggest for high-power pads that you look for commercial heatsinked high-power surplus pads rather than constructing them. Don't get me wrong—home constructed pads can work, but assembling a 10-watt non inductive 150-MHz pad is a little tough.

They can be constructed out of multiple 2-watt high-value resistors, whose combination paralleled value equals the desired single resistor value needed. The lower value required in the "T" pad attenuator arms make this the better selection for home construction and higher power pads. See Figure 3 for resistor values used to construct an attenuator that would withstand several watts of RF power.

Let's discuss the construction of a 20-dB attenuator as per Figure 3. From a formula for a "T" type pad with 50-ohms input and output impedance, the arm resistance (2 each) would be 41 ohms and the shunt resistor would be 10 ohms. Note that each of the input and outputs read 50 ohms in reference to ground and the respective input.

These values are not standard, and if we construct them using standard carbon resistors we can arrive at 40 ohms by paralleling four 160-ohm resistors. For the 10-ohm resistor four 39-ohm resistors are used. A pad or attenuator so constructed from eight 160-ohm carbon resistors and four 39-ohm resistors would yield an attenuation of 20.093 dB. So you see, by being slightly off the mark, the total value required is not real critical.

The wattage of the carbon resistors is a selection choice you have to make. If high powers are anticipated use 2-watt resistors for the attenuator. Reduce the resistors' wattage as you see fit, to include 2-, 1-, or 1/2-watt carbon resistors. If the pad is constructed from groups of four 1/2-watt carbon resistors, then the total pad should be capable of handling 2 watts of power. The same goes for pads similarly constructed out of 1-watt resistors equaling 4 watts of power, and, for 2-watt resistors so assembled, 8 watts of power handling should be feasible.

I can't stress this fact enough. These resistors should be carbon-composition types to prevent unwanted reactances that come from non-RF-type resistors, like wire-wound types. They exhibit an RF inductance to the circuit and should not be used. As a matter of fact, some small value types could be used for small value RF chokes. Use the carbon-composition types and all will be just fine.

Another type of mixer trouble may not be related to RF driving power and switching circuits. In deference to "rear-end mixer problems" this one could be titled "front-end mixer destruction." Front-end mixer troubles are the same product of overloading the mixer with input powers (excess RF level) of sufficient magnitude that it over dissipates the mixer with RF and destroys the mixer. This scenario is the same as previously described before, but now applies to a mixer that seemingly is protected by the RF preamplifier and does not utilize any switching circuitry. What then is going on?

What is happening is that the RF preamplifier used in applications like this are stacked, or are capable of significant gain, say, in the 30 dB or so gain ranges. Because of this high gain the amplifier might be capable of high output RF power like a transmitting RF amplifier. This condition can happen when the receiving preamplifier is subjected to very high input power levels approaching saturation. These levels are easy to create when multiple stations are operating on the same hilltop near each other. Just imagine the input power that a receiving preamplifier is subjected to when, out in the field, you turn your dish antenna towards another amateur's dish when he is transmitting. Not a good thing to try. I blew up a very low noise single-stage amplifier doing just that.

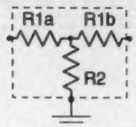
The other problem that could happen, when using a very high gain amplification string amp, or a converted multiple-stage amplifier, is that it will amplify its heart out and give you maximum gain before it goes into saturation (if it survives). The point to consider about protection to the front end of the mixer is, What maximum power output capability does the receiving preamplifier string have when operating under saturation RF input conditions? Most small signal devices will not make good high-power output amplifiers and usually saturate before zero to +4 or so dBm is reached. This is well within the safety range of a mixer's performance acceptance parameters. The maximum is typical to the LO power which is near +10 dBm for most mixers.

Failure to check this one parameter could yield you some surprise. One of our microwave group members *did* blow up a mixer in just the manner described here. It was a choice mixer. It was destroyed because the receiving preamplifier string was capable of providing +20-dBm output (that's 100 mW) when the input circuit was driven into saturation. Imagine a preamp putting out 100 mW. That's a nice transmitting amplifier, but for the poor mixer that's twice the maximum RF driving power and almost certain to over dissipate the signal diodes in the mixer forever.

Prevention of this scenario is simple: test the amplifier strings that are to be used together before connection to pertinent systems. Know what the capabilities are even in modes of operation that you don't expect to use. Just verify these parameters and fixes can be built into the system.

What is the fix for an overpowerful RF preamplifier with too much gain and high-power output? An example of this type of amplifier would be a CATV satellite LNA amplifier, or similar for other frequencies. These amplifiers have very high gains needed for satellite work, and while they are convertible to amateur bands and other services, we need to watch out for applications where the excessive satellite gains used for terrestrial use might be detrimental. In any case the fix is simple; connect a 10-dB attenuator if you experience high-power outputs. This will reduce that excessive power from the 100 mW power to a comfortable +10 dBm power level that is safe for the mixer. The extra gain in the amplifier was soaked up in the attenuator, but with "extra" gain you had some to spare, and I feel sure it will not be missed with the benefits derived from the mixer protection circuitry.

Attenuator



Attenuation	R1	R2	Combinations R1	Combinations R2
10 dB	26 Ω	35 Ω	2 each 51 Ω	2 each 75 Ω
20 dB	41 Ω	10 Ω	4 each 160 Ω	4 each 39 Ω
30 dB	47 Ω	3.2 Ω	4 each 180 Ω	4 each 13 Ω

Notes:

(1) Tie multiple resistors in series or parallel to obtain non-standard resistance values.

(2) Use only carbon composition resistors to avoid RF reactances.

(3) Use 1/2, 1, or 2 watt resistors as required for your power needs.

Figure 3. Attenuator values for possible loss calculations to attenuate RF power of transmitter and receiver protection circuit.

Well that's it for this month. I hope you and yours have a Merry Christmas and a Happy New Year. 73 Chuck WB6IGP

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Switches and Fuses

New term; new kids; new ideas; and of course old problems. Every year it seems that we who are on the front lines with young students must keep coming up with new ways to get their attention, and new techniques to test that they have indeed learned the material. The teacher of ham radio in the classroom, fortunately, has many tried and true experiments and demos at his or her disposal to help get the concepts across.

I'm always looking for new hands-on projects to do in the classroom, but there are some simple ones that I use every term because they are effective and the kids really like them. The following two projects can be adapted to any group in grades 4 through 8. Every child in the class should be able to participate on some level; or it can be done at home for extra credit.

The book *Inquire* by Educational Service, Inc. has a good lesson for "Making An Electrical Switch."

Purpose: To make an electrical switch and show that it works on the same principle as the electrical light switch.

Materials: Three lengths of light insulated wire (one piece 11 inches long and two pieces 20 inches long), an 8 x 8 inch board (2 inches thick), a 20-watt light bulb, a light socket to fit the light bulb, #6 dry cell battery with terminals, wire cutters, 2 popsicle sticks, a hammer, and three nails.

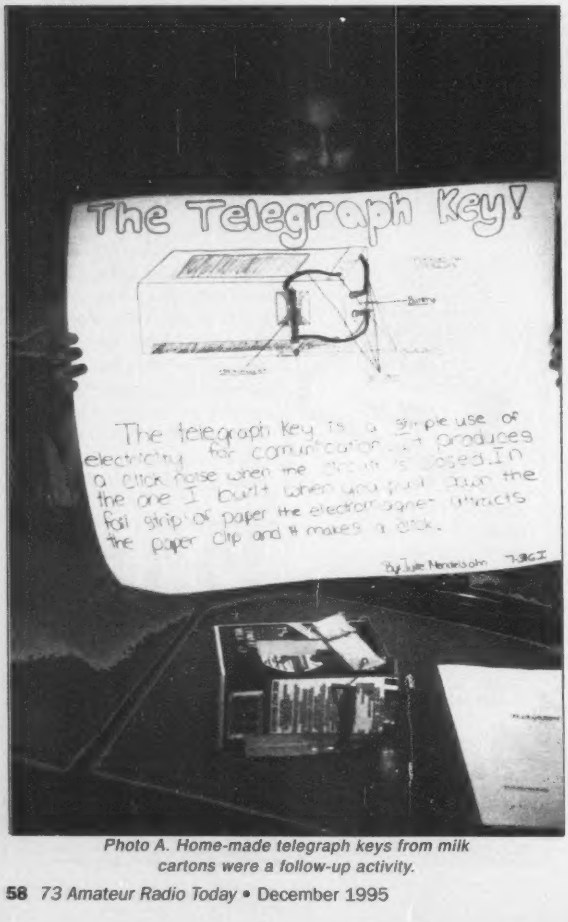
The Telegraph Key!
The telegraph key is a simple use of
electricity for comunication it produces
a click noise when the circuit is closed. In
the one I built when you push down the
foil strip of paper the electromagnet attracts
the paper clip and it makes a click.
By Julie Mendelsohn 7-3G1

Photo A. Home-made telegraph keys from milk cartons were a follow-up activity.

Procedure: Take 6 inches of the insulation off one end of both of the 20-inch-long pieces of wire and 2 inches off the other two ends. Also take 2 inches of insulation off of both ends of the 11-inch piece of wire. Wind the 6 inches of uninsulated wire around one end of the popsicle stick, one wire on each stick. Nail both ends of one stick firmly to the board. Nail only the wireless end of the other stick to the board (do not nail down firmly) so you can turn the popsicle stick. Attach one end of the 11-inch wire to a light socket terminal and one end to a battery terminal. Attach the free end of the movable popsicle stick to the other light socket terminal. Then, attach the free end of the stationary popsicle stick to the other light socket terminal. Insert the light bulb into the socket. Turn the movable popsicle stick so its uninsulated wire touches the uninsulated wire of the stationary popsicle stick completing the circuit and lighting the light bulb.

Photo B. The children used charts and other instructional aids to demonstrate their circuits. That's Vinny (7th grade) on the left, and Joe (6th grade) on the right.

Variation: Divide the class into groups. Duplicate the directions for making a switch and have each group make an electrical switch as a project. The groups will know if they followed directions correctly if the light bulb lights up.

When your students have mastered the skills you require from the above project, let them try this next one at home and then show and tell the rest of the class their results. "How Does A Fuse Work" is a natural follow-up activity.

Purpose: To learn how a fuse works.

Materials: The switch used in the above activity, and a piece of thin tin foil.

Introduction to the class: "Today we're going to learn how a fuse works. Then we will make one for ourselves. An electric fuse is a protective device for the electrical system. The fuse is a soft metal, with one point having a lower melting point, enclosed inside a fireproof container. When there is a problem inside the electrical system, such as, a short circuit or too many appliances operating at the same time, the fuse will melt or blow, breaking the circuit. This blown fuse indicates that something is wrong with the circuit and should be corrected. In the case of a short circuit, the short should be located and repaired. What should be done if the fuse blows because too many appliances are operating at one time?"

Procedure: Disconnect the light socket and insert in its place a piece of thin tin foil. We now have our fuse. Let's see what happens when a fuse blows (melts). I will turn the switch to complete the path of the electrical circuit. What happened class? Correct, the thin tin foil gets warm and melts, breaking the electrical circuit. What happens when a fuse blows at home, school?

Some of my groups made excellent charts and posters showing their work. When they made their presentation to the class they were well prepared with visual aids and lots of "teacher tools" to make their points more clear.

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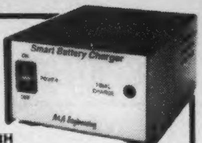

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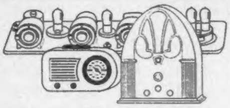

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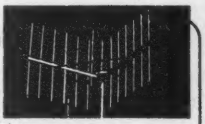

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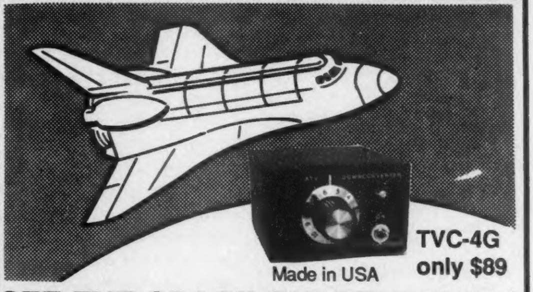

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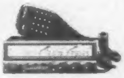
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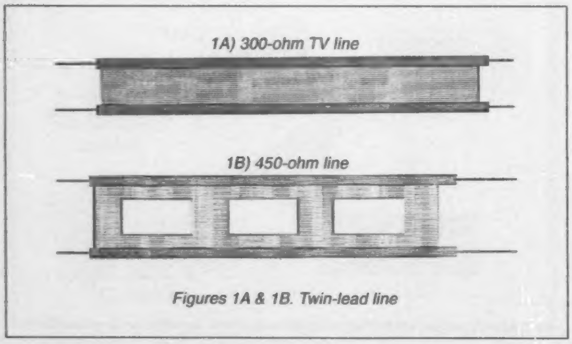
Some Ham Antennas Made From TV Twin-Lead

Twin-lead transmission line (Figure 1) is generally quite cheap, and can be used to make a variety of different antenna types . . . as well as being used to carry signals back and forth between the rig and the antenna.

Figure 1 shows two popular varieties of twin-lead transmission line. The variety of twin-lead shown in Figure 1A is 300-ohm television antenna transmission line. TV-style twin-lead has small diameter copper conductors separated by a rubber or plastic insulating material, all molded into one piece. This type of line is quite light for transmitter use, but will easily handle power levels up to a couple hundred watts. I know only one person who routinely used 300-ohm twin-lead on a kilowatt rig, and he claimed it ran uncomfortably hot to the touch!

A thicker, wider, and tougher form of twin-lead is the 450-ohm stuff shown in Figure 1B. This line usually has square holes cut into the plastic insulator separating the conductors in order to reduce losses. The 450-ohm line can be used at higher power levels than the 300-ohm line, and is a reasonable replacement for a 600-ohm parallel, "open-air," transmission line called for by some antenna designs.



Figures 1A & 1B. Twin-lead line

The "Quick 'n' Dirty" Twin-Lead Antenna

The antenna shown in Figure 2 is one of the first that I ever used (when a mentor, W4II, gave me a roll of twin-lead wire), after seeing it in an early edition of Bill Orr's (W6SAI) *Radio Handbook*. I ran this type of antenna out a basement window, and attached the top end to an old pine tree, and the middle supported by a 2X4 nailed rather unceremoniously to a tool shed on the back of the house.

Basically a quarter-wavelength "Round Robin" Marconi, it consists of 300-ohm or 450-ohm twin-lead transmission line with a length of $234/F_{MHz}$. Thus, for 40-meters the length would be about 32 feet 6 inches long overall. The 52-ohm coaxial cable is connected such that the center conductor goes to one conductor of the twin-lead, and the shield goes to the other. If you desire, ground the shield of the coax, as well as attaching it to the twin-lead.

The "Quick 'n' Dirty" (or "Round Robin" as my mentor called it) can be installed at an angle (as shown), although I suspect best performance occurs when the wire is straight. In the version that I had, there was only a small VSWR with one bend that put the vertical and horizontal segments at about a 120-degree angle.

This antenna works better than single conductor Marconi antennas because regular Marconis suffer from ground losses. By supplying a return line, the radiation resistance is raised from 10 or 15 ohms, to something on the order of 40 to 50 ohms—which makes it a good match to 52-ohm coaxial cable.

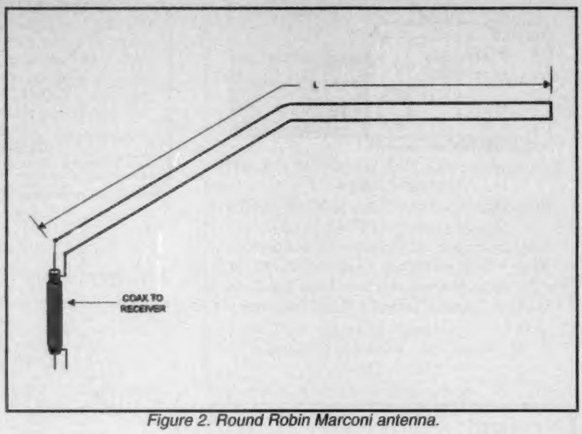


Figure 2. Round Robin Marconi antenna.

Folded Dipole

The folded dipole (Figure 3) is one of the most popular twin-lead antennas. It's a half-wavelength dipole made of twin-lead. Note that the parallel conductors at the ends of the antenna are tied together (and soldered, by the way). The feedline is connected to the folded dipole in the center of one of the conductors. If 300-ohm twin-lead is used as the transmission line, then it can be connected directly to the radiator element. But if you want to use coaxial cable to feed the antenna (which is a heckuva lot more convenient), then use a 4:1 balun transformer between the coax and the antenna's feedpoint.

For low and moderate power operation, the folded dipole is a reasonable choice for hams. It has a bit more bandwidth than the straight dipole, so is easier to use without a lot of adjusting of the antenna tuner (especially with modern rigs that have a VSWR shut-down circuit). On the negative side, the typical folded dipole is somewhat less robust than the standard dipole. Unless special measures are taken, the folded dipole may very well come falling down in winds a bit more than a gentle breeze. Some of those special measures are discussed in detail in my book *Joe Carr's Receiving Antenna Handbook* (HighText Publications, Inc., P.O. Box 1489, Solana Beach, CA, 92075; $19.95). If you want to build a folded dipole, then I highly recommend that you review that material.

The azimuthal pattern of the folded dipole is a standard "figure-8," very nearly the same as for regular dipole antennas. In other words, it is bi-directional and transmits broadside to the wire; there are two nulls, one off each end of the wire.

Folded Dipole Beam Antennas

Over the years it became popular to make beam antennas from folded dipole antennas. A well-designed, properly installed two-element directional antenna refocuses the figure-8 pattern of the half-wavelength dipole or folded dipole into a single direction, resulting in a gain of about 3 dB (ideally). A 3-dB gain is equivalent to doubling your transmitter power. The actual gain will be somewhat less, in most cases, because of installation or design difficulties.

The antenna shown in Figure 4 uses two folded dipoles, installed parallel to each other about one-eighth wavelength (l/8) apart. One folded dipole acts as a reflector and the other as a driven element. Which is which can be

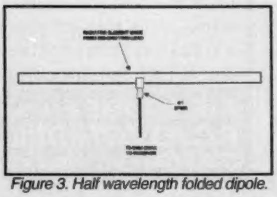


Figure 3. Half wavelength folded dipole.

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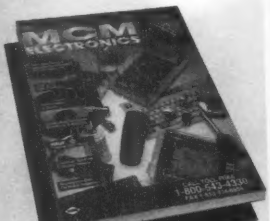

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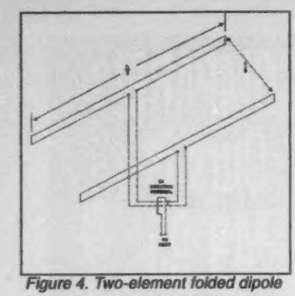

Figure 4. Two-element folded dipole beam features reversible directivity.

changed by using a double-pole, double-throw (DPDT) switch at the point where the two feedlines come together. This switch must be heavy duty, even for moderate power levels. I've seen a large light switch used in this manner. A pair of "three-way" AC power switches, ganged with a brass rod to make their toggles work together, can be used.

So why do you want to change which is the reflector and which is the director? It's simple: this antenna is bi-directional, but only one direction at a time. The antenna transmits in the direction of the one that is excited, with the other element acting as a parasitic reflector. Reversing the roles of the elements reverses the direction. In an ideal beam, the reflector would be a tad longer than the driven element, but in this case they are the same length which results in a bit of deterioration.

It is very important on this antenna to make the two feedlines exactly the same length, even if it means wasting a bit of wire on one of them. If you want to feed this antenna with coaxial cable, then the 4:1 balun transformer can be placed at the common terminals of the DPDT switch.

An old favorite with the twin-lead crowd is the ZL-special shown in Figure 5. This antenna is very much like Figure 4, except that the two folded dipoles are connected together with a phasing harness made of 300-ohm twin-lead. Spacing is about l/8 to l/4, while the most usual prescription for the phasing harness is to make it either l/4 or 3l/8 long. Keep in mind that the electrical length is shorter than the physical length by the amount of the velocity factor of the line. If you want to make a l/4 phasing harness with line that has a velocity factor of 0.80, then the physical length would be:

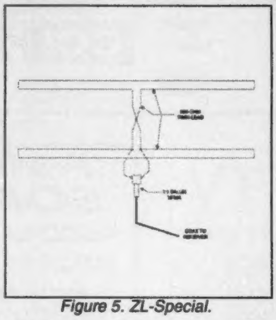

Figure 5. ZL-Special.

$$246V/F_{MHz} = (246 \times 0.80)/F_{MHz} = 197/F_{MHz}.$$

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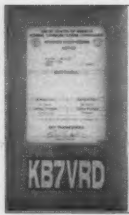

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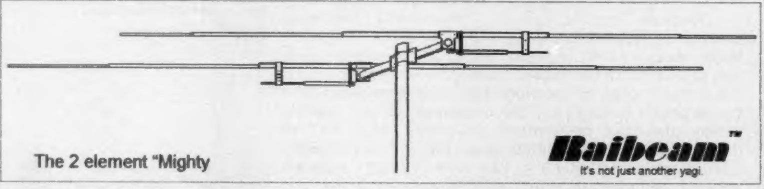

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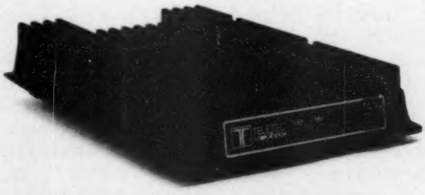

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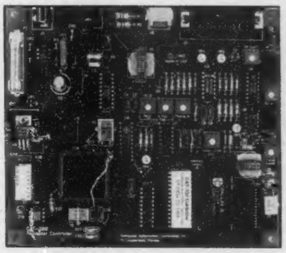

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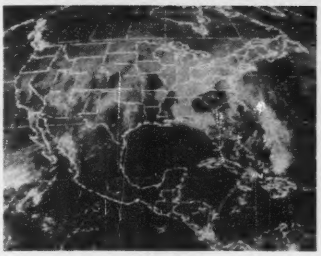

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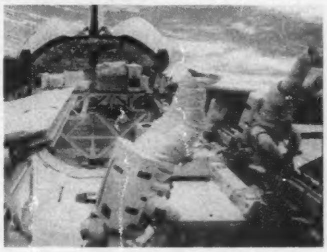

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There's nothing quite like spending quality time working on a few simple circuits. You generally can get a hefty helping of the warm fuzzies when even the simplest circuit functions as planned.

So, let's take a look at several simple circuits you can build. Some are modifications to commercial rigs, others are stand-alone projects.

This month, I've also started something different. Since many of the best circuits are simple, there's usually no PC board. "Just use perf-board" is the battle cry we hear all the time. Well, I've been working on this long-time problem from my end. Starting with last month's RIT for the Small Wonder Labs rigs, I've laid out the schematics using a PC board CAD program called "CIRCAD," which has the ability to generate a "net list" after the schematic has been laid out. By using this net list feature, it is possible to lay out a PC board and be fairly sure it will work. Provided the schematic is correct that is! The PC board will only be as accurate as the schematic. I've found it hard to change from my old way of making PC boards. First, I build a prototype board, make corrections, make another set of PC boards, make corrections, and so on until the finished PC board is accurate. Needless to say, that takes a lot of time and money. By using CIRCAD, you generate the schematic, import the net list, autoroute the board and you're done.

There is also another added feature. I will upload all the files in a PKZIPped format to both CompuServe and America Online. The files will be in the HamNet SIG hiding within the QRP section library files. Use the key word "CIRCAD" to locate the files in the libraries.

On America Online, the files will be in the ham radio SIG. CIRCAD, while a commercial product retailing for about $1,000, is also available from both services, runs under DOS and requires at least 4 Meg RAM and a hard drive. CIRCAD will *not* run under windows. The demo version *does* work and will generate artwork. However, there is a limit on the number of ICs that can be used and it will not generate either the gerber or drill files. Other than that, the demo version will work just fine to "fine tune" any of these smaller projects. I'll have a complete review of CIRCAD coming next year. Look for it.

One last note about these PC boards. I do not have the free time required to build and try out each and every circuit. The PC boards "should" be error free. Keep the hate mail down to a minimum if the boards don't work as they should. However, if you find a mistake, by all means let me know and I will correct the files and replace them on the BBS. I would check and double-check any artwork before committing to a large run of PC boards. I'm sure you may need to tweak a few of my layouts to suit your needs or requirements.

The first circuit is a modification of last month's RIT by Dave Benson. As I mentioned last month, it would be rather easy to build on a RIT "on" LED to the circuit. Well that is exactly what I did. I also put on the PC board lots of pads to make connections to and from your transceiver as easy as possible. I added some decoupling capacitors to the VCC pin of the 4066 for good measure.

The schematic for the modified RIT is shown in Figure 1. The PC board I laid out is not as small as Dave's version. Instead of standing the resistors and diodes on end, they are laid down flat. There are no mounting holes—you can use double-sided foam tape or hot melt glue.

Here is one more add-on circuit for the popular MFJ QRP radios (Figure 2). This circuit watches the RIT voltage and will tell you if the RIT is active or not. This circuit comes from Paul Harden NA5N. Basically, the circuit consists of two op-amps (in a single 8-pin DIP package) which constantly monitors the RIT line. The circuit is designed for the MFJ mono-banders, but you may be able to find diverse uses for this project.

In a nutshell, one op-amp monitors the voltage generated by the RIT control when it is moved from its center position. When the RIT control is moved, the voltage across it changes. By comparing the RIT control voltage against the reference voltage generated by the two pots, the op-amps will switch states, lighting the LED. How tight you set the two reference pots will determine where in the RIT control the LED will light.

I have not given this circuit a try, but have used voltage comparators like this one for years. If you have trouble with noise or RF getting into the comparators, tack on a 0.1-µF capacitor at the junction of R3/R1 and the voltage reference pots.

To fancy things up a bit, instead of the junk box LED, how about using a bi-color LED instead? This way you can tell what direction the RIT is set. You will need to remove the two steering diodes and insert a current-limiting resistor in their place. Any value from 470 ohms to 2k ohms should be fine.

The basic circuit can easily be changed to provide a battery status indicator. Instead of feeding R2 with the RIT voltage from the MFJ rig, use a stable voltage reference source such as a LM336Z 5.0 diode. Again, remove the two diodes and in their place install a 1k-ohm resistor. By using two LEDs, you can set one comparator to give you a green OK for the

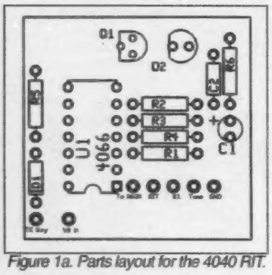

Figure 1a. Parts layout for the 4040 RIT.

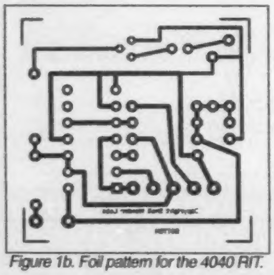

Figure 1b. Foil pattern for the 4040 RIT.

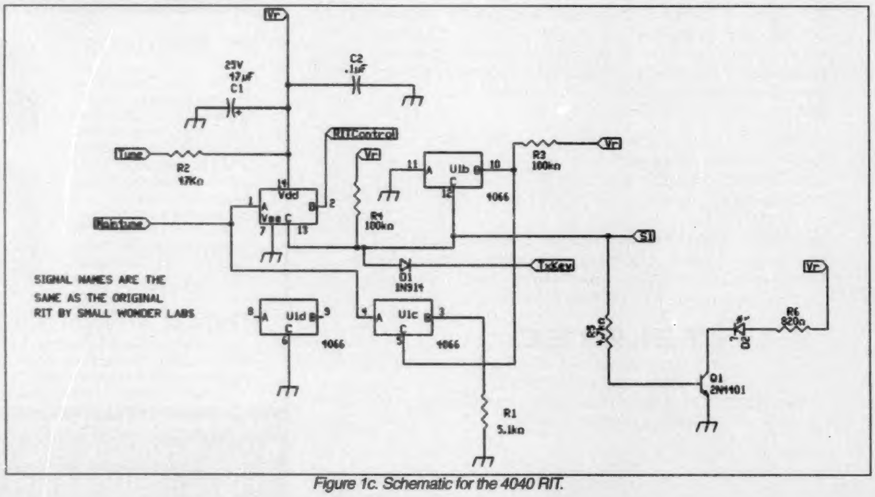

Figure 1c. Schematic for the 4040 RIT.

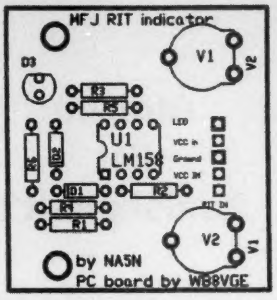

Figure 2a. Parts layout for a RIT voltage detector for MFJ QRP radios.

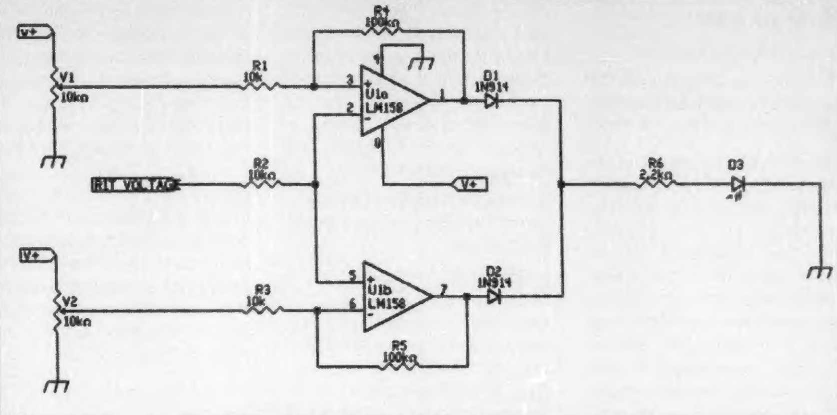

Figure 2c. Schematic for a RIT voltage detector for MFJ QRP radios.

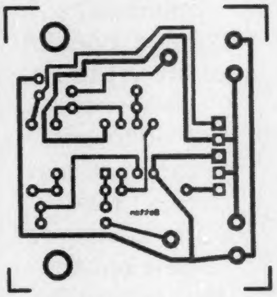

Figure 2b. Foil pattern for a RIT voltage detector for MFJ QRP radios.

battery. The other comparator will light a red LED when the battery voltage drops down. You select the voltage points by using the two pots. Although I laid the circuit out for single turn pots, you might want to put in 20-turn trimmers to make setting the reference voltages a bit easier. Also, by adding a resistor to the top and bottom of both pots, you can expand the voltage divider, making the setting of the reference points easier still, even when using the single-turn trimmers.

Although you would need an external op-amp to boost the output from a SWR bridge, you could easily adapt the circuit to warn you of an excessive SWR on your portable antenna. This really is an easy-to-use circuit and its use is limited only by your imagination!

As I mentioned earlier, both the PC and the schematics will be uploaded to America Online and CompuServe. Both will be hiding within the ham radio SIGs. On CompuServe, the files will be in the QRP SIG library inside HamNet. Both files will be "zipped" to speed download times. You will need the demo version of CIRCAD to view or modify the files. CIRCAD is available on both systems.

I'm currently working on putting together some modifications to the Ten-Tec Century 21 series of rigs. There seems to be a rather big hole when it comes to modifications and fixes for this classic rig. Although not a QRP transceiver by any means, many a Century 21 has been put to use by QRPers. If you have any modifications for this rig, by all means send them to me.

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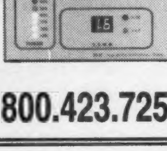

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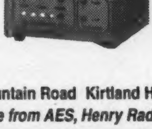

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HAM TO HAM

Continued from page 50

answered very authoritatively "Oh my gosh, no, you'll be insulating it from the air and it won't work!"

Even though we talk about getting on-the-air, and our signals radiating through the air, direct contact with the air isn't a factor in whether a particular antenna works well or not. When the astronauts were on the moon's surface, with no air anywhere except within their space suits, their radio signals made it back to earth in fine shape. The rubber ducky type of antennas seen on virtually every hand-held transceiver, though not in direct contact with the air, seem to do a pretty good job for the most part. In fact, I've painted several ham antennas using a flat lacquer-based spray paint without any regrets, only longer life from the antennas!

It's true that using insulated wire for a horizontal dipole will change the dipole's length requirements slightly, but it certainly won't prevent it form working just as well as a bare-wire antenna. Most people don't use insulated wire for wire dipoles simply because there's no point in paying for insulation that isn't really needed. A dipole is normally strung up high enough in the air to be out of reach of children and others, so insulating it from accidental human or animal contact isn't usually a factor. If it's not up high enough to be out of reach, I'd definitely opt for the safety factor of insulated wire!

But a thin coating of non-metallic paint on your 2-meter beam or vertical won't affect the resonant frequency to any appreciable degree and it certainly won't render it an ineffective radiator or receptor of RF energy. Just make sure that any metal to metal contact points aren't inadvertently insulated, and I'd stop short of getting any paint on the matching section—just in case it requires a minor change in tune-up—or on any insulating connection blocks to avoid possibly changing their insulating properties.

Before any painting, I would also make sure that the aluminum is thoroughly cleaned of any oil that might have been used during the machining process and that any shiny aluminum be lightly sanded to give better grip to the paint coating. Flat gray primer spray paint is usually a good choice for this type of situation since it's formulated for good adhesion on bare metal. And it's best to do all spray painting out-of-doors, in calm weather, for safety and health reasons.

A Word Of Caution In Using Spray Contact Cleaners Near RF Circuitry

Spray contact cleaners, those commonly sold to clean noisy switches and potentiometers, should be used with a great deal of caution around any parts carrying RF voltages and high RF voltages in particular. This would include using these sprays on any band-change rotary switches used in many of the older ham transceivers, linear amplifiers and the current lineup of manual antenna tuners.

Before the broad-band, no-tune final RF stages became commonplace in ham transceivers, most rigs used mechanical, multi-section rotary switches to accomplish all band-changing functions within the radio. The temptation to use ordinary spray contact cleaners on these switches, however, especially the sections carrying high voltage RF, should be strictly avoided.

Many of the popular spray cleaners will leave behind an oily deposit, used to lubricate the item being cleaned, but in RF circuits, this oily deposit can soak into the switch's insulating wafers, causing them to lose some of their non-conductive RF insulating properties. That oily surface will also cause dust and grime to collect on the insulator, further exacerbating the problem by gradually creating a semi-conductive surface on the insulating wafer. The final result can be arcing and eventual carbonization of the wafer material—particularly if it's of a phenolic base—with almost certain destruction of the switch—and perhaps other associated parts—in the end analysis.

The lesson to be learned here is to never use ordinary control-cleaning spray on RF circuit parts, particularly if that spray leaves behind an oily lubricating film. If RF switching sections absolutely must be cleaned, take the time to do it by hand, with a swab, using only small amounts of cleaning medium and then only a medium that will evaporate completely without leaving behind any left-over residue. In reality, rarely do these switches need any more cleaning other than simply being "exercised" several times through their entire rotational range. The switch contact wipers will usually clean themselves with this simple procedure. They're normally plated with silver, and even though the silver appears black because of tarnish, silver oxide is nearly as good of a conductor as shiny silver, so don't be fooled into thinking that a "really good" cleaning is needed. Looks can sometimes be deceiving.

I'll return with more Ham To Ham tips, suggestions and techniques next month, but in the meantime, jot down some of your ham-related favorites and send them to me at the address shown near the beginning. I'm not able to return all submissions, however, so please make sure that you send non-essential copies, or include a self-addressed and stamped envelope for any material that you must have returned to you and I'll do my best to get it back—no guarantees though. But here's the best part, Uncle Wayne Green will send you ten dollars for every tip that we use in this column, plus make you a hero with all of your fellow hams! What an incredible deal!

73, DE Dave, NZ9E

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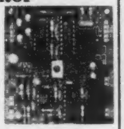

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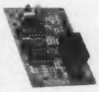

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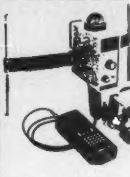

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I don't know about you, but I feel especially warm and fuzzy this year. They say that "into each life some rain must fall," and, without going into details, my family has been inundated in a monsoon this past year. Therefore, in honor of the winter holidays and their traditions, let me make some suggestions for gifts to make the digital amateur happy.

Kantronics offers their KAM Plus, a packet controller that operates any of the popular HF digital modes and VHF packet, simultaneously. In one small package, they pack enough features to make just about anyone on packet, RTTY, or AMTOR happy.

This is the "Home-brew" issue, and if you are interested in putting together your own station, from the board level up, you might do well to look at Hamtronics. They have transmitter and receiver boards for VHF and UHF, most under $200 each. How about a 1200-baud modem kit for fifty bucks? This is only a sample of what Hamtronics has for the RTTYer. A catalog and gift certificate may be just what the doctor ordered.

Speaking of home-brew, TEC-200 film is an interesting product. If you have a ham interested in construction, and are looking for an inexpensive gift, you could do a lot worse than five bucks for this stuff. Copy the circuit onto the film using a plain paper copier, iron it onto the circuit board, peel and etch. Sounds neat, and worth looking into. The Meadowlake Corporation makes the stuff available. Let me know what you think.

I mentioned Buckmaster a while back, and they have some nifty items for the ham on the list. CD-ROMs with international call sign databases for fifty bucks, or with a collection of shareware programs and data files for half that price are just two of the items available. Check with them to see the latest material available on this exciting new medium. Then again, if you are flush with funds, check out the complete collection of 73 Magazine on microfiche for $285. Oh, well, if only they offered this on CD-ROM! (Hint . . . hint!)

Another call sign database is the SAM database, available on either floppy disk or CD-ROM for forty dollars. Several options are available, to allow county reference, license expiration, birth date, or others. Check this one out through RT Systems, Inc.

Ramsey Electronics has been a perennial favorite for little kits and things. Between transmitters and receivers and DTMF boards, this is another potential catalog and gift certificate item. Check it out and see if you don't agree.

With the number of questions I get every month about Baycom, let's not forget Tigertronics and their BayPac modem. This little modem, designed for Baycom, costs about fifty dollars, and is just a tad larger than a DB-25 plug. This may be just the ticket for turning that laptop and hand held into a packet station.

Now, for those of you who still use mechanical teleprinters, a few little sources and tips. Ribbons labeled for Model 15s may not grace the shelves in your local office supply store, but Underwood typewriter ribbons are usually at the top of the list. They will work just fine. Get the heavier type, for longer life. Lithium grease, perfect for lubricating the vanes and levers, may be found at the automotive counter in little tubes, perfect for the tool box. Restore the black crinkle finish of your machine's cabinet with liquid black shoe polish, if it is just a tad dirty. If the paint is badly messed up, there are spray crinkle finishes in the hardware or paint store, although they take a bit of practice to use right. While you're in the stationery store, pick up some type cleaner for those Model 15s and Model 28s. They have putty types, typing sheet types, and liquids with brushes, messy as that sounds. Look around, I'm sure there will be something of interest.

Now, the computer-type digital hams have a veritable plethora (there I go again) of goodies to choose from these days. From inexpensive floppy disks, disk holders, copy stands, screen cleaners, mouse pads, and who knows how many other ten-dollar and under items, the sky is the limit if you care to spend some real money. Anyway, if you are shopping for the computing ham, your best bet may be a gift certificate from the local computer superstore.

In keeping with this month's theme of gift giving and neat products, this month's world wide web site is a potential source for many a gift. The Raymond Sarrio Company has listed an amateur radio discount catalog on the web, which promises prices below retail. Take a look for yourself at:

http://www.csz.com/sarrio.html

and let me know what you think.

Incidentally, all listings for items or sources in this month's column have come through my perusal of ads, literature, or other such material. No manufacturer has solicited space in this column, nor are many even aware of this column's existence, for that matter. Therefore, if you contact any of these folks, be sure to tell them that you read about their fine wares in *73* magazine's RTTY Loop column, okay? I mean, might as well boost the column and the magazine when you can.

Can I put in a specific plug for the column here? Okay, regular readers of RTTY Loop are quite aware of the RTTY Loop Software Collection, a compendium of software, primarily for the PC-compatible crowd, that caters to the widest variety of digital amateurs. Now up to a dozen disks, each one may be yours by sending me a blank 3.5-inch high-density disk, a stamped self-addressed disk mailer for return to you, and $2.00 in US funds per disk, to the address at the top of the column. Now, I would not expect you to just order the disks blindly, and we have covered the contents of some of these disks before. A full listing is available by snailmail, by sending me a self-addressed, stamped envelope for return of the printed listing, or via E-mail, to any of my electronic mailboxes:

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Even if you don't want to ask about the disks, I look forward to your comments, questions, and suggestions. Talk about gifts, your input is just what I desire! My very best wishes to each and every one of you for a Happy Chanukah, Merry Christmas, Joyous Kwaanza, and a Healthy and Successful New Year.

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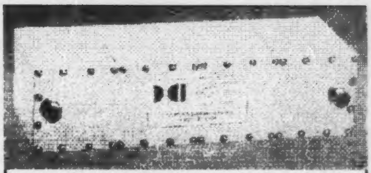

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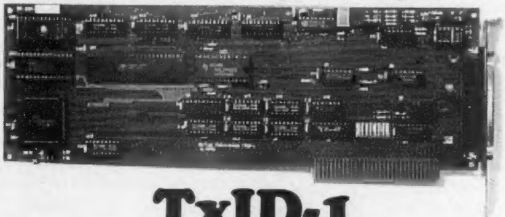

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Foxhunting's Wide World

For many years, weekend television featured a sports program that celebrated the thrill of victory and the agony of defeat. It covered prominent and obscure sports of every kind, from arm-wrestling to Zamboni-racing. But there is one sport I never saw on this or any other show, despite the fact that thousands engage in it every year in dozens of countries around the world. Most of those who do it are hams, but a ham license is not required in order to compete.

The sport I'm referring to has a number of names including foxhunting, foxteering, and foxtailing. The "foxes" being hunted aren't animals, they are low-powered radio transmitters. The competitor who uses his or her personal radio direction finding (RDF) equipment to locate the most foxes in the shortest time wins. Foxhunting contests are held all over the world, sanctioned by the International Amateur Radio Union (IARU). Local, regional, national, and international champions are chosen in separate rounds on 80 meters and two meters. Hunters are scored individually and as national teams.

Unfortunately, North Americans have never won an IARU-sanctioned international foxhunt. In fact, only a few from this continent have ever participated in this kind of radio sport. Why? Because hams here have a different view of how to play hide-and-seek with radios. We usually call it T-hunting or bunny-hunting. Instead of running through the woods, we drive for a while (sometimes a long while), then go on a short on-foot "sniff" at the end of the hunt.

Many hams tell me that the "sniff" is their favorite part of T-hunting. If you feel that way, you'll love international-style foxhunting. Maybe you have what it takes to become a world champion!

Photo A. IARU rules call for hunters to start through a 50-meter corridor, turning on their gear when they reach the end. The space between two areas of the Marine Mammal Care Center made an excellent corridor for Hamcon/Foxhunt-95, because waiting contestants could not easily see in which direction earlier starters went. Kevin Kelly N6QAB is off and running, followed by Ken Mirabella KM6YH.

Hamming Your Way to Fitness

Unlike American-style mobile T-hunts, an international-rules foxhunt is a formal event. It takes lots of preparation and on-site staffing to put one on. Sanctioned hunts must follow the 12-page IARU document, "Rules for Championships in Amateur Radio Direction Finding."

An IARU-rules foxhunt course comprises five low-power (0.25 to 1.5 watt) fox transmitters in a hilly wooded area of about six square kilometers. The foxes are spaced such that the shortest distance from the starting point to each one and then to the finish line is 5 to 12 kilometers. Foxes must be at least 400 meters apart. The first must be at least 750 meters from the start.

Each fox transmits for 60 seconds, one after another in numbered sequence, all on the same frequency. A continuous transmitter on a different frequency at the finish line helps hunters find their way home to the finish line oonce they have found all five foxes and marked their scoring cards with the unique punches attached to each fox. Scores are determined primarily by the number of transmitters found, and secondarily by elapsed time. Contestants are individually timed. They start at five-minute intervals, coinciding with the start of fox #1 transmissions. This scatters the contestants on the course to minimize "follow the leader" problems.

Foxhunting is a map-and-compass exercise as well as an RDF test. Successful hunters pay careful attention to their exact location and the bearings to all foxes at all times, plotting them on detailed topographical maps provided by the organizers. They know that if they miss a fox bearing, they must wait four minutes to hear that fox again. They also eye their watches, since exceeding the time limit (100 to 140 minutes) means disqualification. In other words, it is better to return under the time limit with only one fox found than to find all five but take one minute over the limit.

Each target transmitter has distinctive identification, sent continuously in CW or MCW. Fox #1 sends "MOE" continuously, plus callsign. Fox #2 sends "MOI," fox #3 sends "MOS" and so forth. Even without knowing Morse Code, contestants can identify the individual foxes by counting dits.

To aid competitors who get lost, a homing fox at the finish line transmits "MO" continuously on a separate frequency. Two meter foxes in IARU championships transmit AM with tone modulation. Eighty-meter foxes send keyed CW. The 80 meter and 2 meter events are on separate days so each entrant can compete on both bands.

Under IARU rules, all competitors use the same venue and the same foxes, but they are divided into four separate divisions: Seniors (males 18 to 40 years), Juniors (boys under 18), Women (any age—nobody asks!), and "Old Timers." Only Seniors are required to find all five foxes, in any order. Others need find only four foxes; the designated four are different for each division.

Each country entering a championship match may field one or more teams of three to five contestants each. Team score is a function of the best three individual scores. Team members are not allowed to help one another; Course Marshals are alert for violations. Medals are awarded to top team and individual entrants. This makes for a total of eight individual and eight team medal sets awarded in gold, silver, and bronze at a championship meet. There are no cash or merchandise awards.

Foxhunting World Championships take place every three years. The seventh was in September 1994 at Sodertelje, Sweden, about 25 miles southwest of Stockholm. In the years between, regional meets are scheduled. IARU Region 1 (Europe and Africa) held its championships in September of this year in Chtelnica, Slovakia, with twenty countries represented.

In IARU Region 3, China and Japan are the countries with greatest foxhunting activity.

Others, such as Australia, are becoming more and more involved in the sport. National ham societies such as Japan Amateur Radio League sponsor foxhunting as a means of recruiting newcomers to the hobby. Australia will host the next IARU Region 3 Championships at Townsville, Queensland, in July 1996.

What about IARU Region 2, which encompasses North and South America? Sad to say, there

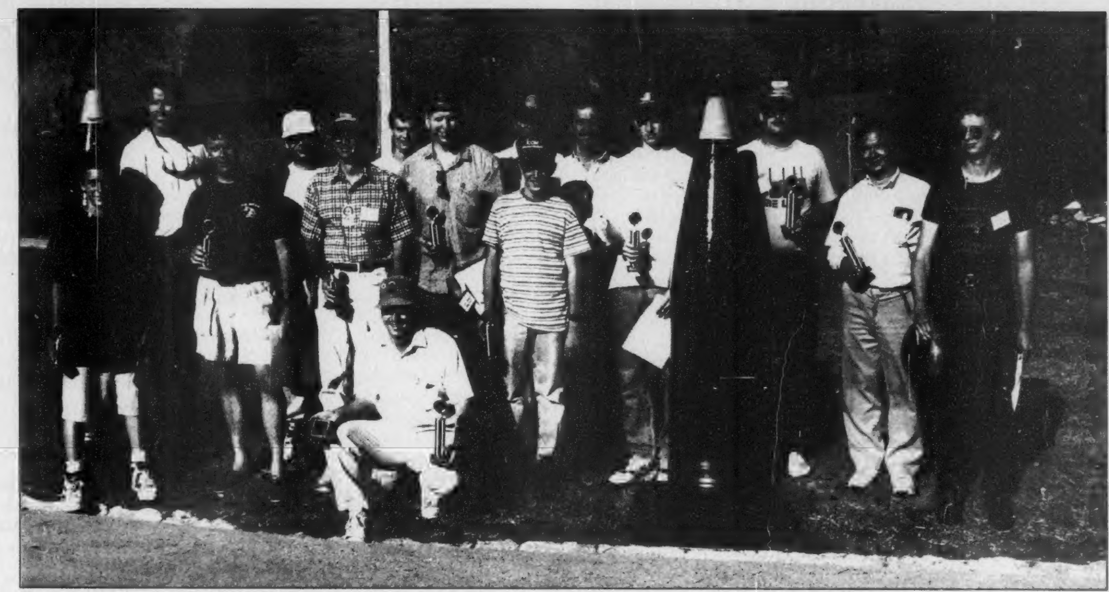

Photo B. With four age divisions and five cash prizes in each, many Hamcon foxhunters finished "in the money." Happiest of all was Scot Barth KA6UDZ (kneeling), who received the mounted-compass Sweepstakes Award for fastest overall time (1:06:21) to find all foxes.

are no IARU-sanctioned foxhunts here, despite the fact that ARRL Headquarters in Newington is the International Secretariat for IARU. Presently, hams from Region 2 who want to compete in IARU championships must travel overseas and enter unofficially. IARU events have a "friendship" category for participants who are out of their region or are not national champions. There is also a "promoters" section for newcomers wishing to run the course without being part of the actual competition.

Before we can convince ARRL and IARU to hold championships in Region 2, many more T-hunters (and some League officials) must learn about the fun of international-rules foxhunting and practice it to gain proficiency. Several individuals and groups in the USA and Canada are promoting this radiosport, as you will see in upcoming "Homing In" columns. This month, I'll tell about what's happening in southern California.

Hamcon-95

It all started when the Southern California Six Meter Club (SC6MC) volunteered to put on a transmitter hunt for Hamcon-95, the ARRL Southwestern Division Convention on the Queen Mary during Labor Day weekend. Sunday afternoon Southwestern Division convention T-hunts are a tradition that goes back over 15 years. Up until this year they have always included long-distance drives. Many have had multiple transmitters. The lure of hefty cash prizes brings out up to twenty mobile teams to Hamcon hunts. SC6MC T-hunt chairman Bob Hastings K6PHE and wife Gracie KK6CG have enjoyed small-scale on-foot foxhunts put on by the United Radio Amateur Club of Los Angeles, so, when someone suggested an all-on-foot foxhunt for Hamcon-95, they agreed immediately. As an incentive for a good turnout, Hamcon organizers approved $500 in cash prize money and the SC6MC board agreed to spend $200 on trophies, certificates, and refreshments.

Here was a chance to introduce the T-hunters of southern California and Arizona to international-style foxhunting. To do that and to convince the convention organizers that their money was well spent, a good turnout was important. Convention-goers had to be told in advance to plan on staying in the Long Beach area through Sunday and to bring on-foot "sniffing" gear.

Beginning in early August, the word went out by repeater bulletins, packet, Internet, and on-line services that a new and exciting kind of transmitter hunt was on the agenda for Hamcon-95. The announcements included a summary of international-style foxhunt rules and suggestions for simple foxhunting equipment. Convention-goers were invited to sign up for the hunt and also to attend a two-hour Foxhunt Forum at the convention center Saturday morning. At the forum, a room full of neophyte and old-time RDFers heard all about international hunts from your columnist and two other hams who have experienced them, J. Scott Bovitz N6MI and Kevin Kelly N6QAB.

Three weeks before the convention, it was my duty to be hider for the Los Angeles area "Pathfinder" Saturday evening mobile T-hunt. It turned out to be an opportunity for hunters to practice for Hamcon/Foxhunt-95. It was also a chance for me to try in-the-park hiding and get a better idea of what makes a fox location easy or hard. WA6OPS and I put the mobile hunt T in a ravine in Rancho Cucamonga, 18 miles from the starting point. Its beam was pointed so as to create signal reflections from the nearby San Gabriel mountains, just so it wouldn't be too easy.

The ravine was just east of a beautiful 40-acre park, where we concealed six miniature foxes. When hunters found the ravine transmitter, a note instructed them to come to the park, where we gave them competitor cards and told them to hunt down transmitters #2 through #7. We timed each person start-to-finish, just as in an international-rules hunt. A dozen hams tried the park course. All had fun, and many decided then and there to try hunting for dollars at the convention.

No Forests Here

The biggest problem in putting on Hamcon/Foxhunt-95 was locating a suitable site. A dense forest is best because navigation is more of challenge and hunters can't observe one another unless they are very close. Unfortunately, the closest forests to Long Beach are dozens of miles away and they aren't very dense anyway. K6PHE and KK6CG suggested Angel's Gate Park, which turned out to be an excellent choice.

This 130-acre complex is only a ten-minute drive from the convention center. Only a small part is wooded, but the rest has an abundance of interesting features to make up for that. Fort MacArthur Military Museum is there, with dozens of old buildings, bunkers, and fortifications, perfect forconcealing radio foxes. This park overlooks the Pacific Ocean, so moderate temperatures prevail during the day. This is important, because afternoon highs often exceed 100 degrees around Labor Day just a few miles further inland.

Our goal was for Hamcon/Foxhunt-95 to be as close to an IARU-rules hunt as practical, but we made a few changes to

Continued on page 78

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Continued from page 4

industry has bought and paid for a few senators, it isn't.

Well, the congressional brakes have been on when it comes to EMFs also, with the power companies facing hundreds of billions of dollars in expense in meeting any reasonable magnetic field limitations.

Thus I was surprised and delighted to read a report from the National Council on Radiation Protection and Measurements (NCRP) committee which calls for strong action to stop the exposure of the US population. It endorses a 2 mG exposure limit, to take effect immediately for new day care centers, schools, playgrounds, and new transmission lines near existing housing. And it would be phased in more slowly for existing schools, housing, and businesses.

The report was funded by the EPA and has been called by them to be "the first comprehensive review of the world's literature on EMF health effects."

The government's past field strength guidelines have been set at 10,000 mG for a few hours a day for the public and 5,000 mG for the constant exposure by workers, so the new guidelines lower them by over a thousand times! Are you still using that electric blanket?

It's an 800-page report, so I won't cover it all. But, in essence, what I've been saying about the exposure to magnetic fields has been right on the money, with no exaggeration. The report shows that there is "a positive association between childhood cancers and exposure to EMFs generated by electric power transmission and distribution systems."

The action of these fields on the faster-growing cells of children and unborn babies is more evident, but there is plenty of evidence that the slower-growing cells of adults are also affected, and the effects are not in any way beneficial. Another case of slow poison for you.

So, compare this report with the recent rash media baloney saying that EMFs have not been proven to be dangerous. Don't the power companies wish! But the power companies advertise in our newspapers, on the radio and TV, and have been bribing the heck out of our congress, so they tend to control the media and the government. If they would spend a little of the money we're paying them for power to help develop cold fusion power generators instead of PR aimed at staving off the inevitable, we'd have much cleaner air and cheaper electricity.

We're seeing a replay of the cigarette and asbestos episodes in our history. Well, if congress can't get itself to be honest with cigarettes, maybe the FDA will get into the act.

And I'm no fan of the FDA. With 95% of our FDA approved drugs never proven to be effective (bet you didn't know that!), and no efforts at all to check any alternatives not coming from the pharmaceutical industry, the FDA is a tyrant which seems to be hurting us far more than helping. It seems to be a tool of the pharmaceutical and health insurance industries, and in bed with the AMA, which is not famous for its ethics.

Hmm, I can see the headlines now, "Wayne Green shot by unknown assailant."

Now, if you still disagree with me about EMFs, and you're not doing it out of ignorance, then let me see your data. I've been doing my homework on this for several years and the NCRP chairman is a good friend of mine.

Well, it's good to see that the government may finally be lumbering into action on EMFs.

Repeater Groups, Please Advise

With the FCC getting fed up to here with complaints about repeaters, and with no help seemingly available from the ARRL and their Repeater Advisory Committee, things have taken the course you might expect when there are few guidelines and ample room is left for the expansion of egos.

Starting from the top, one of the last things in the whole world amateur radio needs is to ignore any situation that is causing the

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FCC agitation. We're on very thin ice as it is, so we really don't need to poke the lion with a sharp stick. Remember, we're dealing with political appointees and bureaucrats. The appointees (Commissioners) have more politically important things to worry about than amateur radio, what with the incredible growth of communications technology, so we don't want to be in the position of a bothersome fly that is causing aggravation and is more likely to get swatted than cared for.

Sure, within my memory amateur radio was paying it's dues by supplying trained or at least trainable technicians and operators in time of war. It was, until 30 years ago, the major supplier of high-tech career oriented youngsters. It was also the pioneering ground for new communications technologies—up until 30 years ago. It used to be a major factor in providing emergency communications, but CB, cellular telephones, and improved business and government communications systems are phasing us out in this arena.

Thus, every complaint to the FCC is like a fly buzzing around, asking to be swatted. Even more irritating and alarming to the Commission are the complaints delivered via a member of Congress to the FCC from a ham constituent.

What Are The Beefs?

State repeater coordinator groups are, by and large, doing a fine, if often thankless, job of assigning channels for their areas. But where a resource is finite, there are going to be arguments and bitching over it's use. This natural source of contention has been made worse by some coordinators taking advantage of their position of responsibility. Bribery, the patronizing of friends, and such have been causing complaints. When a new group wants to set up a repeater and is told that there are no available channels, they tend to get upset. And when they find that one individual has eight repeater channels assigned, six of which are rarely in use, this does not make for happy campers.

I get around the country quite a bit. In each city I visit, I check out the repeater channels, looking to say hello. And I listen and scan the 2m band to see how much repeater activity there really is. When I'm able to call in on a dozen repeaters, with no one answering my call on any of them, what am I to think? When I scan the band and hear maybe one repeater in action in an area where there are no more available channels, I know something's wrong. In other towns I try the listed repeaters and find that virtually all of them are guarded against me by PL access. They're private. No trespassing. Visitors keep out. Non-paying hams keep out.

So we have hams complaining to the FCC, writing their congressmen, and even suing. None of these approaches are going to do any good, and the chances are they can do a world of harm.

The FCC vs. the ARRL

When the FCC put increased pressure on the ARRL to take more responsibility in mediating repeater problems, thus taking the heat off the Commission, the League called a meeting of the coordinators. The coordinator groups were instantly suspicious of Big Brother stepping in and telling 'em what to do. Well, the FCC is pushing for one "point of contact" to deal with repeater problems, so what organization would be more logical than our only national ham organization? Alas, the ARRL's reputation for even-handedness is not shining. They have always tended more toward running amateur radio as a dictatorship than a democracy and, while League aparatchiks are comfortable being told what to do, we still have a few hams who prefer that their opinions be considered.

Through some genetic mishap, I'm one of the trouble-makers who doesn't like to be told what to do. Ask me and I'll do just about anything. Tell me, and go to hell. Thus I've been an enemy of dictatorships, communism, and socialism, much preferring democracy. Yes, it's been a losing battle in America, with socialist programs smothering our school system, health care, welfare, and so on, through a dozen generous government bureaus.

In the ham field, I agree we need a national organization, but I think it should be structured opposite from what it is. I believe that QST should be a communications medium for the discussion of proposals for rule changes, and that the directors should poll ham

Continued on page 76

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Continued from page 75

present these at director's meetings, just as our congressmen are supposed to do. And probably would do if we would stop lobbyists from buying their influence. So, instead, we have the ARRL board making the decisions and the directors then telling the unwashed what they are. The word goes down from on high, not up from the members.

This is not the system that I would want making decisions on repeater matters, so I can understand why many coordinator groups are alarmed at the prospect of the League being set up as the single point of contact with the FCC.

I suspect that the League isn't at all anxious to have this nasty monkey on their back. It's a thankless job, complete with the potential for fighting bitter law suits. And there is no upside. It won't increase revenues. It isn't going to increase their languishing membership. And it'll obviously cost money to handle.

My recommendation was for the state and area coordinator groups to pass the hat to fund a National Coordinator Committee and hire a General Secretary — preferably a retired ham, and Lord knows we have more than enough of them. The NCC would be incorporated to limit liability and would be the point of contact for the FCC. It, in turn, would contact a coordinator when a problem arose. This approach would get the whole thing out of the political arena.

Since coordinators have a lot more to do than repeater coordination, the NCC should have a newsletter to provide communications. Coordinators have to take into consideration all VHF/UHF ham band users, not just the repeater groups. Repeaters have to live with SSB, ATV, satellites, weak signal, moonbounce, packet, and so on. So the coordinators have to agree on band plans for these bands.

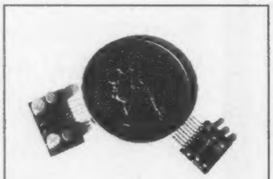
My suggestion as a way to deal with this isn't new. I propose that the NCC hold a biennual (every other year) national conference where all proposals for FCC rule or band plan changes would be discussed and voted on by delegates from interested clubs and coordinator groups. I talked this over with the FCC Commissioners a few years ago and they thought this was a great solution to the aggravation and cost of their dealing with amateur radio rule changes. They agreed that the Commission would supply legal help for any such conference to help expedite new rules being enacted. This would make it so our amateur radio rules could be more in step with technology and the current needs of the hobby.

Will Democracy Work?

Perhaps, as the Yugoslavs and more and more little wars around the world between ethnic groups are proving, mankind is not yet able to peacefully resolve differences. So perhaps my idealistic dream of a self-regulating amateur radio service is unattainable.

But we've come a long way during the almost 60 years I've been involved in the hobby. I got snickers and ridicule when I first proposed that we do our own license testing. We've gotten rid of many restrictions that hobbled us in the past. But as long as emotions rule minds, we're going to have problems.

Should we continue to encourage the use of 450 MHz for repeater linking, or should we move it on up to higher and less used bands? Without linking, what would 450 occupancy look like? Is there a need for more channels, and thus pressure to encourage the ATVers to move higher? For that matter, how many ATVers are there on 420? We need more data. And then we need the probably unattainable: cooler heads.



Are circuits getting smaller? Or is this a pre-inflation quarter?

If we can organize an NCC, I'd like to see a yearly audit of band occupancy in each area. With computer-controlled scanners it's fairly easy to run such an audit. But then we'd also want to check for legitimate usage. I still remember how the US military occupied allocated short wave frequencies by transmitting so many hours a day, whether they had any traffic or not. The use showed up on the ITU reports, showing activity, and thus preserving the frequencies. I remember visiting one of the Army stations in Heidelberg and seeing their transmitters holding down a whole list of frequencies with test transmissions.

So let's let the Tutsis and the Hutus kill each other and see if we can learn to give and take to accommodate the 73 different hobbies we're enjoying and call ham radio.

Good News For Entrepreneurs!

The socialists in congress are pushing to raise the minimum wage. This is indeed good news for entrepreneurs. Frankly, I hope they raise the minimum wage to at least $7.50 per hour, which is around $15,000 a year. How can a family live for much less than that these days, right?

Of course this will increase the costs for manufacturers to make products, forcing them to either increase their prices or get rid of workers by replacing them with automation and computers. And this is where you come in.

A good rule of thumb is to multiply the cost of manufacturing a product by about six to cover the costs of distribution and marketing. Thus any increase in worker's pay will be multiplied by six when it reaches the sales price for the product. And that will make many manufacturers no longer competitive with foreign factories, so they will either have to move their jobs to Mexico or some other lower wage country, or automate more to cut payroll.

If you spend much time on the telephone you know that more and more companies have replaced telephone operators with automated message handling systems. There are fewer and fewer jobs for low-skilled workers. And there are going to be even less.

The next time you visit a factory, take a good look at what the workers are doing. How many of them could be replaced by a computer or a computer-driven machine? Every time you can replace a worker by a machine of some kind you are going to save the company money. You'll also probably improve the quality of the product.

A worker making $15,000 a year also costs the company around $5,000 more for health care insurance, unemployment insurance, and so on. A machine doesn't come in late and leave early. It doesn't have children that get sick. It doesn't even take long weekends or have to observe holidays. No ten-minute smoking breaks every hour, either.

Companies are going to be looking for consultants who can cut their payroll, either by streamlining the work or replacing un- or semi-skilled workers with machines and computers.

This is going to come as a big surprise to the kids who are dropping out of school. McDonald's is experimenting with automated burger flippers. It won't be long before most fast food chains can be run by half as many workers or less.

For instance, suppose you could punch in your order on a keyboard by your parking place as you get out of your car? You'd put your credit card in to pay and get a card to put that into a slot once inside. Your tray would come out almost immediately with your order. A similar system would work for the drive-through service. If you don't have a credit card you can pay with cash inside. But you can bet that McDonald's credit cards would be plentiful. They might even work at Wendy's, earning you prizes or future Big Macs.

Long Ago

When I first moved 73 to New Hampshire from Brooklyn in 1962, just two years after starting it, I hired a bunch of college dropout hams to come work for me. I paid $20 a week, plus room and board. I had up to eight hams living in my 40-room house and we had a great time. I cooked the meals, we put out the magazine, and we set up one heck of a ham station way up on Mt. Monadnock, a few miles away.

When I bought a small offset press we started also putting out a small VHF magazine, a contester's magazine, and one for club newsletter editors. High school kids came in after school and helped collate, staple, and address these publications for 50¢ an hour. They got some spending money. It helped keep them out of trouble. And they got to learn about the responsibilities of working.

I had one ham working with us who was so much trouble that I finally gave up and tried to fire him. He pleaded with me to let him stay and keep working without any pay. Being a sucker, I said I'd give it a try. After a couple weeks I told him he wasn't worth nothing. He then offered to pay me $20 a week if I'd let him stay.

I finally agreed to let him stay if he'd live in my house up on the mountain and help clean out the brush around the place. Just don't come down and aggravate us here. Well, for instance, I did the cooking and the live-in hams took turns washing the dishes. When it was Tedsy's turn he managed to turn a half-hour job into a four-hour job. The same when it was his job to empty the wastebaskets or shovel out the horse stalls.

Tedsy came down from the mountain one day and asked if I minded if he put up a vee beam for six meters, aiming it down the east coast. What could go wrong? I said sure. The next thing I knew a few weeks later he'd cut down a couple dozen big trees to make a path for the two legs of his vee beam. Worse, he'd miscalculated a bit and the beam was actually aimed at Bermuda, so no one down the coast could hear him.

I remember him walking up with a broken yardstick in his hand. He looked at me sheepishly and explained that he'd had it in his mouth and walked through a 30" door.

Bless The League

One day the government arrived. They'd had a complaint about my paying less than the minimum wage. I pushed them to find out where the complaint had come from, and they said it was the ARRL in Connecticut. They said I'd have to stop paying the hams with the room and board and $20 a week, pay them regular wages, and charge them for the room and board. And the after-school kids would have to get at least the minimum wage.

I automated the collating and addressing of the publications I was printing, thus getting rid of the school kids. The hams were replaced by local people doing most of the work. No more room and board. No more fun. And without the gang to keep the ham shack up on the mountain operating, I closed it down and sold the place. Well, we all had the time of our lives while it lasted. Several of my alumni have gone on to be successful entrepreneurs.

You better believe that the lobbyists in Washington from Mexico and other low-wage countries are pushing congress hard to increase our minimum wage. Every dollar it goes up will mean millions for their countries, and more welfare and unemployment problems for us.

One alternative is to improve our school system so we'll have better educated and better skilled workers so we can compete better internationally, but here we're up against the most powerful lobbies in the country, the teacher's unions. And they're unfailingly supported by the mass ignorance and apathy of voters.

Say, if we move the minimum wage up to $15 an hour we'll no longer have any poverty, right? Who could possibly be against that? If they move it to $20 I might even consider working again.

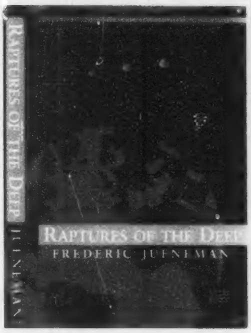
Teapot Tempests

The ham newsletters have been scraping the barrel lately. Like f'rinstance, the FCC, which has been refusing to issue special calls, got forced by the USIA into issuing one for the VOA's 50th anniversary: K3VOA. Sigh. And a judge awarded N5DA $10,000 from N5EWD for some names he was called over the local repeater. Oh yes, the West Coast IARN director quit after an abusive call from Baxter. And WA6ITF is pissed at Baxter for messing with his news reports. An average week.

With KV4FZ presumably QRT after his court conviction, I wonder how the mess he generated on 14,313 is progressing. I suppose there's no real hope of getting Congress to grant a special exemption from prosecution for blowing away the rest of the BARF gang. It's the lack of reasonable loopholes in our laws that are making the Mafia so successful. If we could attract some Sicilian hams, perhaps we could get our bands cleaned up. Lord knows the ARRL seems to have absolutely no interest whatever in the problem.

Rapture!

There's a new book out that I've just got to get you to read. How are you going to learn anything if you don't read? Instead of wasting big parts of your life on nonproductive amusement like watching ball games (of any kind), stupid TV crapola like sitcoms, game shows, soaps, and all that gawking OJ foofarah, pick up a book, a highlighter, and read.



You can read on buses, planes or trains, in the back seat if someone else is driving (Sherry drives—I read), and while waiting for your waiter in a restaurant (they're called "waiters," right?). You have the same 168 hours a week to work with that I do, and I'm polishing off a couple of books a week, and that's in addition to keeping up with around a hundred magazines a month. I'm no magician. I'm not doing anything that you couldn't do, if you wanted to. Now, what can I write that will get you off dead center? Dead is the operative word there.

For instance, if I can get you to (a) buy the book and then (b) actually read it, you're going to have the time of your life with Raptures of the Deep by Fred Jueneman. It's just out, but I got a sneak preview via a disk copy from Fred last year. Barnes & Noble estimate that 50% of the books they sell are never read. I'll bet it's more like 80%, from my experience in talking with people.

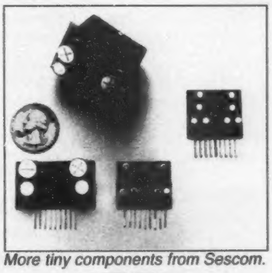
The sorry fact is that most people are not reading books. I was talking with a product of our local school system the other day and I asked her how many books she's read. Oh, about 15 in the last ten years. All fiction. Sigh. It's no wonder she's stuck in a low-paying job that requires few skills and little knowledge.

What's Raptures about? Well, it's nonfiction, and it's about what we understand in science today, and the challenges facing scientists in just about every field. Jueneman has done an incredible job of research on how and why scientists believe what they do about our world and how it works. And none of the usual math equations scientists don't seem to be able to help themselves from using (and make them seem brilliant). Oh, the egos in the Ph.D. fields! I know hundreds of Ph.D.s now, by virture of my cold fusion adventure. Some are great fun to talk with, others can't help letting their egos show. That's a natural manifestation of insecurity (aka an overcompensated-for inferiority complex).

The "Raptures" of the title has to do with our living at the bottom of a sea of nitrogen (air is 78% nitrogen) and thus suffering from nitrogen narcosis (raptures of the deep, as experienced by divers who get too much of it).

To get an idea of the breath of the book, just look at the 12-page index in the back. Three columns per page! Fred has done a remarkable job of historical research in a surprising number of fields.

The book runs 286 pages, costs $30, and is published by Research and Development magazine, where many of the chapters originally appeared in Fred's columns, which he's been writing for them for over 20 years. Yes, I'll have the book available via Uncle Wayne's Bookshelf. ISBN # 1-57450-001-5. You can help Fred by pushing your local library to get a copy. It'll make a wonderful gift for a youngster who has learned to read, if you know any. 73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HOMING IN

Continued from page 72

accommodate standard two meter FM gear and to equalize the field. The four divisions were based on age only, not sex. Age brackets were determined Saturday night after sign-ups were complete. See the sidebar for a summary of the rules.

Sign-ups for the Sunday hunt were accepted all day Saturday at the convention hall. Upon registering, entrants received a sheet of rules and directions to the staging area. We were concerned that if they knew in advance exactly where the hunt would be, they would go there early to get the lay of the land. Besides giving some an unfair advantage, this would interrupt the fox hiding committee's work. So we pulled a switcheroo. The instructions told them to report to the Los Angeles Maritime Museum, two miles away from Angel's Gate Park. There they were met by a foxhunt committee representative. When all hunters had arrived, the group was told the actual hunt site and given directions to it.

Forty convention-goers signed up for the foxhunt, which sets a record for entries in a Southwestern Division Convention RDF contest. Ages ranged from 11 to 70. Two were non-hams and the rest were licensees of all classes. The hunt went smoothly and everyone had a great time. A wide variety of equipment was used, from sophisticated sniffers to simple "body shielding" maneuvers. Almost everyone found at least one transmitter. Five found them all.

I hope reading about Hamcon/Foxhunt-95 has inspired you to try international-style foxhunting in your home town and given you some ideas on how to do it and promote it. If your club has never done RDF contesting, it's an easy way to start the fun. If you have been doing mobile T-hunting for a while, it's a great change of pace. Who knows, a sports channel may make us all famous some day!

Next time, I'll have more on Hamcon/Foxhunt-95, including stories of two handicapped hams who participated. In the coming months, I'll tell how other groups here and abroad practice for international championships. You will also learn about transmitters and RDF setups that work best for this kind of hunting.

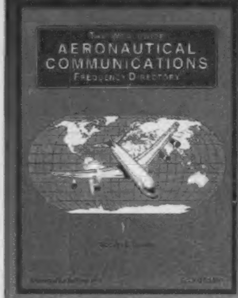
I want to hear all about RDF contests in your area, whether you do mobile T-hunting or on-foot foxhunting. Send your stories and photos to the address at the beginning of this article or send e-mail to me via Internet (Homingin@aol.com) or CompuServe (75236,2165). 73

(See Rules Summary page 81)

Tons of New Ideas!

360 pages of ideas for new businesses, new solutions for our more serious social problems, improving our schools, improving health care, cutting the federal budget, making foreign aid pay off big, and so on. This book is based upon Wayne's reports to the New Hampshire Economic Development Commission. Here are new ideas you'll wish the presidential candidates would promote. Send for "We the People Declare War on Our Lousy Government." Only $12 postpaid, while they last. Uncle Wayne's Bookshelf, 70N202, Peterborough NH 03458-1107. Or call 800-274-7373 during business hours. It's a great Christmas item for any conservative thinker.

The Worldwide Aeronautical Communications Frequency Directory



This new [illegible] page book by Robert Evans has quickly become *the* definitive reference for aeronautical DXers worldwide. Second Edition Only ... **$19.95 (+$2)**

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Comprehensive and fully informative. Applicable to the novice as well as to the advanced monitor. A book second to none. I could go all night with superlatives. ***New Zealand DX Times***

Quite simply the best and most authoritative book on aircraft communications. ***Short Wave Mag.***

This has to be the most complete treatise on HF, VHF and UHF voice and digital aircraft communications we have seen. Over 2350 discrete frequencies are given exhaustive attention with in-depth explanations of who, what, where and why various communications take place. A bargain at $19.95. ***Westlink Report***

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PB-18 KENWOOD 7.2v 1400mah	$49.25
EBP-24S ALINCO 7.2v 1500mah (was 65.00) now	$39.00
BP-84S ICOM 7.2v 1400mah (was $63.00) now	$44.00
PB-33 KENWOOD 6v 1200mah (was $49.00) now	$40.00
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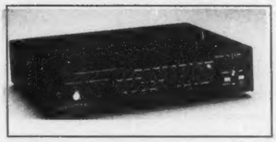
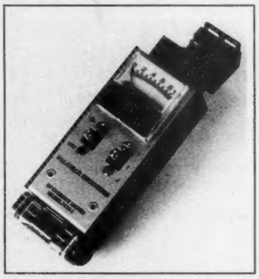
NEW PRODUCTS

Compiled by Ron Galik KA0AET

Radio Adventures Corp. has released the C5 advanced CMOS Frequency Counter chip. The C5 delivers many unique and useful features in a 28 pin DIP. The C5 along with a standard 74HC02 and three low cost driver transistors drives a six digit seven segment LED display to 100 Hz resolution. Frequency range is DC to beyond 50 MHz and the update rate is approximately 40 times per second making the display update appear almost instantaneous. The C5 can be used to build general purpose frequency counters and is especially useful in building frequency displays for home-brew, transceivers or to add a display to vintage tube type equipment.

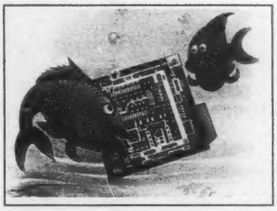


Advanced Electronic Applications, Inc. has released the PK-232MBX and PK-900 multi-mode data controllers are now shipping with Global Positioning Satellite system (GPS) firmware. The biggest new feature is that GPS commands can be remotely programmed, so in Stand Alone Tracking applications where a TNC, GPS receiver, and radio (no computer) are installed in a vehicle—it is all done remotely. The data controllers automatically transmit their position information at user-defined intervals and can also be remotely polled for GPS location information. This remote polling is great for those who use the TNCs in a Pete Bros. ULTIMETER-II™ weather set-up. Each member of an amateur radio group in a region can set up a weather station in the back yard, then other members can poll (at any time) the various weather stations for information. Doing this forms a picture of the region's weather on the Automatic Packet Reporting System map (APRS ™, by Bob Bruninga). Mobile packet users can be transmitting their position information in a Stand Alone Tracking configuration and still act as a message forwarding mailbox—all while mobile.



Palomar Engineers model PCM-1 RF Current Meter

Palomar's new clamp-on RF current meter makes it possible to check ground radials one by one to find broken radials and to determine antenna efficiency. It also checks currents on coaxial cable shields. It fits any wire from the smallest to f(1,2)" in diameter. It has three ranges: 0.1, 1 and 5 amperes full scale with direct panel meter readout. It is compact, handheld, battery operated for use right at your antenna—no other equipment is required.



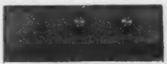
AMTECH has released three SMT solder creams for working with surface mount components. The NC 500 series eliminates solder balls and is a halide- Halogen-and, VOC-free.

The WS 400 series is water washable and non-hygroscopic. The FRS series is fatigue resistant at.

New Product reviews and reviewers are welcome. Write to Ron at 73.

NEMAL
ELECTRONICS

NEMAL Electronics has published a new edition of its cable and connector selection guide. The 48 page guide contains detailed technical specifications and illustrations of more than 1000 cable, connector, and interconnect products. The 1995/96 edition contains more than 100 new products including a section on 75Ω BNC connectors, adapters, and patch panels for serial digital; applications, RF terminations and attenuators, and custom composite cables. The guide also includes comprehensive performance data on a wide range of coaxial cables together with charts for quick selection of appropriate connectors and tooling.

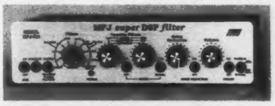

SPA-20A.

AVCOM has also introduced a super portable spectrum analyzer, model SPA-20A. It turns any TV into a powerful 950-2050 MHz spectrum analyzer. allowing the user to find and identify satellite signals, maximize antenna performance, and troubleshoot system failures.

AVCOM has just released the PRC-1 Polarotrol Control Box—a self-contained, battery powered, microprocessor based controller that can control servo-actuated feedhorns or other satellite ham equipment.

AVCOM's PSA-65B portable spectrum analyzer covers frequencies from less than 1 MHz to 1250 MHz and has greater than -95 dBm sensitivity. The lightweight, battery or line operated instrument is perfect for field testing RF systems.

PRC-1



The MFJ-784 DSP Filter has a tunable "brick wall" bandpass, lowpass, highpass, notch filters, programmable pre-set filters and up to 60 dB attenuation. The multiple notch filter eliminates heterodynes, adaptive noise reduction reduces noise, and QRN for voice, CW, and data. It comes with 2 watt amplifier, volume control, input level control, speaker jack, earphone jack, accessory jack, PTT line and PTT sense and line level output. It measures 9" X 2f(1,2)" X 6". It runs on 12 VDC or 110 VAC.

MFJ-452 Super CW Keyboard

MFJ Enterprises, Inc. announces the MFJ-452 Super CW Keyboard with *Perpetual Memory.* This keyboard has a two line LCD display and RFI suppression.

The MFJ-452 features eight 250 character nonvolatile message memories, a 150 character type-ahead buffer, an iambic keyer, and a powerful *Morse Code Trainer*, plus other features.

MFJ-1798 "10" Band Antenna

The new MFJ-1798 is a "perfect 10!" /ten bands that is: 75/80, 40, 30, 20, 17, 15, 12, 10, 6, and 2 meters with only one antenna. This antenna offers separate full size radiators, end loading, elevated top feed, low radiation angle, very wide bandwidth. It's self-supporting and only 20 feet tall. It will mount easily to any ground level spot, tower top, condo, roof top—just about anywhere! The MFJ-1798 is as easy as A B C to tune. The frequency adjustments are nearly independent—adjusting just one band has a minimum effect on the resonant frequency of other bands.

ACCULEX

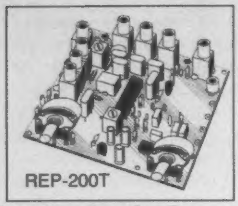
ACCULEX has released a new catalog containing new digital panel meters, counters, timers, signal conditioners, printer cables and other accessories.

Addresses and phone numbers for these fine products can be found on their ads in 73 or by writing 73's Review Department or by calling 603-924-0058.

Continued on page 80

NEW PRODUCTS

Continued from page 79


REP-200T

New Hamtronics® Repeater Models

The popular Hamtronics® line of VHF and UHF FM Repeaters has always offered high quality and more features at a reasonable price. Now the line has been expanded to include some very interesting new models.

The new REP-200T Repeater has all the features of the standard, microprocessor-controlled, REP-200 Repeater with the addition of a new DVR-3 Voice Digital Recorder Module. This allows messages to be *recorded off the air remotely,* using the microphone on any transceiver. It is no longer necessary to use a microphone attached to the repeater to record messages. DTMF commands control the record and playback modes. Thus, the control operator can change the message at any time, and repeater users can also request a playback at any time.

These new features allow the REP-200T to be used for club announcements or warning messages in addition to use as a voice ID, thereby playing the announcement periodically. If desired, the repeater can even use a CW ID, and its voice recorder can be used independently just to play messages on request. These new features don't add much to the cost of a repeater, either. The REP-200T is $1145 in kit form and only $1395 wired/tested.

With the availability of low-cost digital voice recorders, Hamtronics also has developed an economy repeater with a voice ID built in. The new REP-200C Repeater uses a new COR-6 controller module with voice ID but no DTMF decoder or autopatch. This will be especially welcomed by those wishing to put a repeater on the air which is more user friendly for no-code hams to use. It saves a considerable amount of money, too. The REP-200C is only $795 in kit form and $1095 wired/tested.

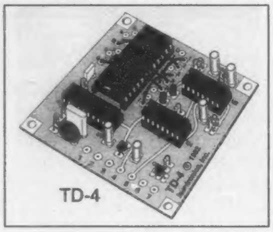
All the above repeaters are available for 6 meter, 2 meter, 222 MHz, and 440 MHz ham bands; and they are FCC type accepted for operation in the commercial hi-band and UHF band. Basic output power levels are offered from 10W to 25W.

Voice-ID Repeater Controller

The new COR-6 module from Hamtronics combines COR circuits and a real-voice ID on one board. It can be used with transmitter and receiver modules to make a simple, low-cost repeater.

A digital IC records up to 20 seconds of your voice, using audio from the repeater receiver. The unit includes tail and time-out timers, courtesy beep, solid-state relay to key transmitter.

The 20 seconds of recording time can be broken up any way you like. You can enhance the basic circuitry by adding a switch to select any of several messages, for instance. You can even use the TD-4 DTMF Controller to allow remote control of recording.


TD-4

With a kit price of only $99, the COR-6 is quite a bargain, considering what voice ID cost to implement just a few years ago. It is also available wired and tested for $149.

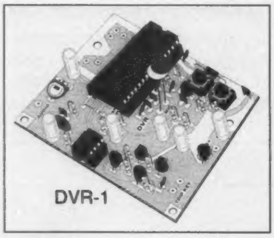
New Hamtronics® VHF FM Receivers

Hamtronics, Inc. has announced new low-cost monitor receiver kits for the 28, 50, 73, 144, 152, and 220 MHz bands. The R100 Receiver was designed to replace both the R144/R220 and R76 series receivers which have long been popular for demanding applications, such as repeaters, audio and data links, packet radio, and remote control. The R100 not only provides a replacement for the older R76 series used for the lower VHF bands, but it also allows easier coverage of the various segments of the 150-175 MHz high band and 200-240 MHz ranges which are popular with commercial customers. In addition, the R100 was designed to have a new positive-acting, wide-range squelch circuit and additional output terminals for repeater audio and discriminator audio, and it is now easier to assemble and align.

The R100 retains all of the popular features Hamtronics receivers have been noted for. It uses triple-tuned circuits in the front end and excellent crystal and ceramic filters in the IF with steep skirts for close channel spacing or repeater operation. The IF selectivity, for instance, is over 100 dB at +/- 12 kHz away from the carrier. Low noise FETs in the front end provide good overload resistance and 0.15µV sensitivity.

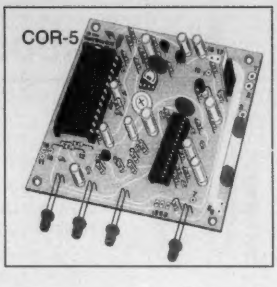
Best of all, the price of the R100 is considerably less than the R144/R220 series. Kits for any of the bands are only $129. Wired and tested units are only $189, a $30 savings. Channel crystals for any desired frequency within these bands are only $12, which is a very good price for commercial-grade crystals. Proportionally-controlled crystal ovens are available for operation over wide temperature ranges.

For more details, write to Hamtronics, Inc., 65-D Moul Rd., Hilton NY 14468-9535 or call (716) 392-9430 (fax: (716) 392-9420). While you are at it, ask for a complete catalog, which also includes all their equipment, including repeaters, transmitters, receivers, transmitting and receiving converters, preamps, and data modems. (Be sure to tell them where you heard about this.)


DVR-1

New Hamtronics® Digital Voice Recorder

The DVR-1 Digital voice Recorder is a versatile PC board module, which is designed primarily as a voice ID'er for repeaters. But it also provides features so that it can be used as a contest CQ caller or as a "radio notepad" to record short parts of received transmissions for instant recall.


COR-5

As a repeater ID'er, the DVR-1 module will record your voice, using either the built-in microphone or an external mike. It can be used with almost any repeater COR module, including the Hamtronics® COR-3, COR-4, and COR-5 (used in the REP-200 Repeater).

As a contest annunciator, you can record a message or even several messages. Eliminate fatigue or strained voice working contests or DX! Connect the audio output to the microphone input of any transmitter. Play your message back at the press of a switch. Unlike a tape, you don't have to wind back to the start; the voice ID chip in the DVR-1 automatically queues up the message you select.

As a radio notepad, you can keep the DVR-1 module wired to the audio output of a receiver ready to record up to 20 seconds of anything you might want to recall later. Say you are operating a contest or DX and want to be sure you catch the call letters or other information you hear. Simply hold down the record button to make a recording. Pay it back as many times as you like until you are able to make out information others lose in the QRM! The DVR-1 unit can directly drive a small external speaker for applications such as this.

You can also use the DVR-1 to generate a voice message used with a transmitter for fox hunts.

The DVR-1 module is an economical PC board which has recently been reduced in price. It can be purchased either in kit form at $59 or as a wired and tested unit at $99. It includes a small electret microphone and push buttons for record and playback.

Continued on page 84

Continued from page 78

Hamcon/Foxhunt-95 Rules Summary

1. Bring your own RDF gear, spare batteries, compass, protractor, pencil, water, medications, sunscreen, etc. When you arrive, stow your RDF gear in the impound area. Do not turn it on until you reach the end of the start corridor.

2. You will be given an official topographical map of the course to keep and mark up. The course boundaries are marked with green. Forbidden zones (church and Young Marines barracks) are marked with pink.

3. There are six FM transmitters with distinctive MCW ID, all on 146.565 MHz. Antennas may be any polarization. There is a non-scored intermittent beacon at the finish on 145.725 MHz. Do not transmit on any band while you hunt, except you may call for emergency assistance on 145.725 MHz.

4. Your starting time will be given to you in advance. Starting is at two-minute intervals. Contestants in different divisions may be started simultaneously.

5. Age divisions are as follows: Youth (17 and under) Prime (18 through 30) Masters (31 through 45) Seniors (46 and up).

6. Cash prizes in each division will be $50 for first place, $30 for second, $20 for third, $15 for fourth, $10 for fifth. Trophies will also be given for first, second and third places, ribbons for fourth and fifth.

7. You may find foxes in any order. Mark your card with the special punch near each fox. Foxes may be camouflaged. Look carefully for the punch, which will be attached close by. Make sure you punch the right fox number on your card; incorrect punches do not count. If you lose your card, you will be disqualified.

8. You must reach the finish line within 120 minutes after you begin, or be disqualified. Once across the finish line, do not go back onto the course.

9. There is no team competition. Each contestant hunts as an individual and may not accept help from anyone. Non-hunting guests must arrive at the venue with you and remain in the start or finish areas. Any contestant communicating by any means while on the course will be disqualified. Exceptions are for emergency medical assistance and discussions with official Hamcon/Foxhunt-95 Course Marshals, who will be wearing white ribbons.

10. This is an on-foot hunt. You may not use any wheeled conveyances such as bicycles, skateboards, etc. You may not hitchhike. Watch your step, as there are obstacles on paths. There may be wildlife such as skunks and snakes in the park.

11. We are here for fun. There must not be any unsportsmanlike conduct. Disturbing or damaging transmitters, antennas, or punches will result in disqualification. Decisions of judges are final.

Other rules and directions are covered in the text. For the unabridged Hamcon/Foxhunt-95 rules, send an e-mail request to Homingin@aol.com or send a self-addressed stamped envelope to the author.

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BP-83 pack	7.2v	600mAh	$25.00

For ICOM IC-02AT & *REALISTIC HTX-202 radios:*

BP-8 pack	8.4v	800mAh	$25.00

For KENWOOD TH-25, 26, 45, 46, 55, 75, 77 *radios:*

PB-8 pack	12.0v	600mAh	$25.00

For KENWOOD TH-27, 47, 28, 48, 78 *radios:*

PB-13 pack	7.2v	700mAh	$25.00

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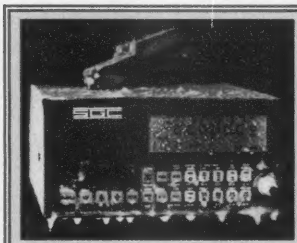
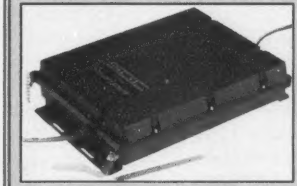


BUY AMERICAN, BETTER PRICE AND QUALITY

The SG2000 HF transceiver is type accepted for commercial and marine service made with traditional U.S. commercial radio quality (and of course it can be used on the ham bands also). While the Japanese radios have 2 final transistors that strain to put out 100 watts on the low bands and only 75-85 watts on ten meters, the SG2000 has 4 large transistors that loaf along at 150 watts on ALL THE BANDS INCLUDING 10 METERS! Some of the SG2000 features are: 1) A control head remotable (no special kit necessary) up to 150' away from the rig, perfect for automobiles and boats. Up to 8 heads can be utilized and used as intercoms also. 2) The largest display of any HF transceiver. 3) 644 pre-programmed memories and 100 user programmable memories. 4) operable from -50F (-45C) to 185F (+85C). You want quality right? Here is what EVERY SG2000 must endure before they're shipped from the factory: 1) They're factory aligned, 2) EVERY SG2000 is keyed down at full power (CW 150 Watts) into an open antenna for about 10 seconds. then connected to a shorted antenna and keyed down for an additional 10 seconds. 3) EVERY SG2000 is put in the "BURN-IN" rack and keyed down for 24 hours non-stop at full power CW. Don't try that with the foreign radios. 4) EVERY SG2000 is then re-checked for alignment and put in the "TORTURE RACK" where they are keyed on and off every 10 seconds for 24 hours. 5) The SG2000 is then re-evaluated and all control functions are verified to ensure that the microprocessor is up to spec. THEN AND ONLY THEN IS THE SG2000 ALLOWED TO LEAVE THE FACTORY.

The bottom line is price, you know how expensive commercial rigs are normally, we are selling the SG2000 BELOW DEALER COST at only $1,585.00 each!! That's a $400.00 savings! We guarantee the best price.



The SG230 SMART-TUNER is the best HF autotuner at any price, and to promote a product that is made in the USA, we're offering it at the guaranteed best price of only $449.00!! WHY THE SG230? BECAUSE: When you tune an antenna at it's base you are resonating the antenna, instead of just matching the coax to the radio as with other tuners such as the AT50, etc. The result YOUR SIGNAL GETS OUT MUCH BETTER. The Kenwood AT50, AT450 and other similar tuners can only match 3:1 mismatches (YES only 3:1) so forget matching anything but a fairly decent antenna. The SG230 can match from 0.5 Ohm to 10 kilohm antennas (up to a 200:1 mismatch), so it can easily match random wires, dipoles, rain-gutters, shopping carts, etc. The result MORE POWER.

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SPECIAL EVENTS

DEC 2

FARIBAULT, MN The Annual Courage Center Handi-Ham Winter Hamfest will be held at the Eagles Club, starting with registration at 8:30 AM. There will be a Handi-Ham equipment Auction, Flea Market, dinner at noon, and Program. Talk-in on 19/79. Contact *Don Franz W0FIT, 1114 Frank Ave., Albert Lea MN 56007.*

JACKSONVILLE, IL The Central Illinois Winter Superfest, co-sponsored by Illinois Valley ARC and Jacksonville ARS, will be held 8 AM-2 PM at Turner J.H.S., 664 S. Lincoln Ave. Set-up at 6 AM. Flea Market, radio and computer dealers. VE Exams 10 AM; pre- reg. required. Contact Tim Childers KB9FBI, 773 E. College, Jacksonville IL 62650. Tel. (217) 245-2061. Talk-in on 146.775(-) and 444.675(+). Advance reservations taken until Nov. 15th. Send SASE with check payable to *Jacksonville ARS,* to *Rich Tavender KB9IXO, 721 E. State, Jacksonville IL 62650.*

MESA, AZ The Superstition ARC Hamfest will be held at Mesa Community College beginning at 7 AM. VE Exams reg. at 7:30 AM-11:30 AM. You must have original and one copy of your license and/or any applicable C.S.C.E. Photo ID required. Walk- ins only. Call *Larry Kuck, (602) 986-2298.* Talk-in 147.12(+) and 449.60 MHz. No PL tone required. Contact *Rick Checketts KA0KZB, (602) 898-9158; Edward Cole KB7RMO, 5264 East Hannibal St., Mesa AZ 85205*; or *Gary Roberts KB7VCP, (602) 461-0644.*

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the April issue, we should receive it by January 31. Provide a clear, concise summary of the essential details about your Special Event.

SPECIAL EVENT STATIONS

DEC 2-4

HOUSTON, TX Members of Clear Lake ARC and Bay Area QCWA Chapter 184 will operate SE Stations to celebrate the end of Hurricane Season for 1995. The Hurricane Party II Special Event will last 48 hours, 0000Z Dec. 2nd-0000Z Dec. 4th. Operation will be in the General Class portion of the HF bands, and on the CLARC Rptr. at 442.75 MHz. In addition to member stations, CLARC club station KC5NZF will operate in a mini Field Day. For a certificate/QSL, send QSL and a 9"" x 12"" SASE addressed to the station worked.

DEC 3 & 7

MESA, AZ EVARG will operate KE7PE 1400Z-2400Z Dec. 3rd and 7th, to commemorate the sinking of the USS Arizona. Operation will be in the lower portion of 20 meters. For a certificate, send a 9"" x 12"" SASE to *EVARG, P.O. Box 1424, Gilbert AZ 85299-1424.*

DEC 16

CONWAY, SC The Grand Strand ARC will operate WD4JMT 1400Z-2400Z in conjunction with the Conway Christmas Parade and Christmas Boat Parade. Operation will be lower General 80-15 meters and Novice 10 meters. For a certificate, contact *Dave Berry KE4OOW, 100 Longwood Ln., Conway SC 29527.*

DEC 16-17

Nazareth and Bethlehem, PA The Delaware-Lehigh ARC will operate the 1995 W3OK Christmas Cities station, 1400Z-0200Z, on 3.965, 7.265, 14.265, 21.365, 28.365. For a certificate, send QSL and a 9"" x 12"" SASE to *DLARC, RR 4, Greystone Building, Nazareth PA 18064.*

Hey, we need good potential cover photos!

LETTERS

Continued from page 6

around noon GMT. *We could use some of that in the US—Wayne.*

John McGowan Once again, KUDOS! Loved the story in Homing In re: tracking false SOS. I started reading your mag about a year ago. I was intrigued by the how-to antenna articles. I've been working in the cellular industry for the past 8 years. As you might guess, antennas seem to be the most vital link in ther chain. I hadn't been involved with ham radio since Boy Scouts, 30 years ago. Well your editorials have piqued my interest again. I've studied the no-code test backwards and forwards. But now comes the problem; where to take the test? I understand that most clubs have VEs, but you'd think the identity of local clubs was a state secret! I've a suggestion for your Special Events column—a posting for clubs. *Sure, why not?*

Don Shipman W3RDF. I read the article entitled " Senior Citizens Upgrade " by Hal Goodman W3UWH in the October issue of *73*. I couldn't help but reminisce about the value and meaning of the top ticket in the days when the author and I got started in this great hobby. In those days the Class A or Extra Class ticket carried honor and prestige and not just the privilege of using more frequency spectrum. Today it lacks the honor and prestige it had in the 40s, 50's and 60's. I recall looking up to Class A hams with a great deal of admiration and respect for their knowledge and true accomplishments. They were the real king pins of our hobby. Not so today. Most are "Extra" in name only and know little about radio theory and are in many cases very poor operators.

Like the author, I got my first license (Class B) in 1950, before the Novice Class was created. I sat in front of the FCC inspector shaking as I waited to see if I passed the 13 wpm code test, then waiting weeks to find out if I passed the written exam. There wasn't a published "question pool" to memorize. There was no "multiple choice" code test. Also like the author , my, family and career were the primary focus of my life and I gave little thought to upgrading until I retired in the mid 1980's. The freedom of retirement provided the time to upgrade to Extra; to become a VE and an Elmer and to enjoy the satisfaction that comes from helping others.

For the past three decades our permissive society has allowed our standards to erode in all walks of life. Kids graduate from high schools without knowing how to read or write. Unqualified people are placed in positions of authority simply to meet quotas and goals, without regard for their ability. Standards in our own hobby have been lowered, making it easy for someone to memorize their way into the ranks of the heroes of the past. It's really sad that many of these Novice Extras, deceived by the pride of their new title, will never strive to understand one tenth of the theory they were forced to memorize. This false sense of accomplishment will most likely quench their desire to become the real Extras they might have otherwise become.

The author made a lot of good arguments for the case of license entitlements partly based on longevity. I believe if his friends really wanted the top ticket they could easily put forth the effort to upgrade. Furthermore, I think his proposal represents another step in the wrong direction of putting people into higher positions when they're not really qualified. Let's not further lower the standards simply to accommodate a certain class of people. The country is beginning to recover from these errors of the past and ifs time our hobby did the same. *Oh. I agree with you. But then what do you suggest we do to generate the five million hams we need if we are going to have a prayer of holding our frequencies? Wayne.*

Mike Snowden KE6HVH Hello to all at 73: First of all I wish to thank all of you at *73 Amateur Radio Today* for a great publication. "Uncle Wayne" has certainly opened my eyes as well as my mind. If only I had found him a few years back. But then as he infers, "it is never too late to start."

I am a "newbie" to amateur radio, just over a year now. Since I have started reading *73*, Wayne

Continued on page 85

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PROPAGATION

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

Conditions this month will range from very good to poor and very poor. You may expect the Very Good conditions between the 5th and 7th, and again between the 21st to 24th, with Good a day or so on either side. The Poorest days are expected to be the 14th to 17th, and 28th to 31st. The remainder should be Fair or trending.

10-12 Meters

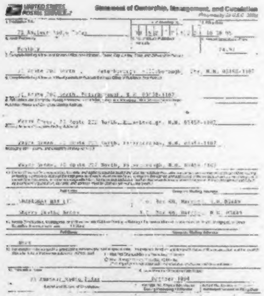
An occasional F_2 opening toward the tropics during daylight hours . . . but, as is usual during sunspot minima, you can't expect much winter activity. Listen and call on the Good (G) or Very Good (VG) days.

15-17 Meters

Short skip and some DX openings during daylight hours on Good (G) and Very Good (VG) days, particularly during afternoon hours. The band closes early, however.

20 Meters

Fair to good DX during daylight hours, peaking shortly after sunrise for an hour or so, and again in the early afternoon; and closing at, or shortly after sunset. Short-skip up to 2,500 miles or so during daylight hours. Again, listen on the Good and Very Good days. Check WWV at 18 minutes after any hour.



30 Meters

A strange and unpredictable band! Sometimes like 40 and other times like 20. Your best bet for DX is late afternoon and early evening hours. Short skip during daylight hours will prevail.

40 Meters

DX to Europe and Africa during late afternoon and toward South America after sunset. After midnight, listen for Asia and the Pacific. Short skip during days and longer skip after dark.

80 meters

This should be your best DX band during hours of darkness, peaking around midnight and just before dawn. Short skip in daytime and longer skip after dark.

160 Meters

Here's another wintertime DX band. Open after sunset, and peaking to the *east* around midnight, and toward the west and Pacific areas near dawn. Band closes during daylight hours due to high absorption of these lower HF frequencies.*

For those who chase DX, you will become avid and frequent listeners and *not* callers. Hover around the band's lower edges on the lower HF bands, and almost anywhere on the higher HF bands. As always, have fun and stay sharp. Let me know how the forecasts work for you . . . and *have a wonderful and happy holiday season.* W1XU

*A vertical antenna is superb for transmitting and fair for listening. How about using one with *both* vertical and horizontal radiation? I'd suggest a vertical loop, switchable from bottom to side feed points if you can have only *one* antenna.

Why muddle the waters? Subscribe to 73.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA	20	40	40	40	80	80				20	15	15
AUSTRALIA	20		20		40	40	20	20			15[1]	15[1]
CANAL ZONE	15	20	20	40	40		20	20	15	15	15*	15*
ENGLAND	20	40	80	40	40		20	20	20	20	20	20
HAWAII	20		20		40	40	80	20			15[1]	15[1]
INDIA	20/40[1]					20[1]	40[1]	20[1]				15[1]
JAPAN	20						20	20				20
MEXICO	15	20	20	40	40		20	20	15	15	15*	15*
PHILIPPINES							20					
PUERTO RICO	15	20	20	40	40		20	20	15	15	15*	15*
SOUTH AFRICA			40[1]	40[1]				15	15	15	20	20
U.S.S.R.	40	80	80	40			20	20	20			40
WEST COAST		80	80	40	40	40	20	20	20			
CENTRAL UNITED STATES TO:												
ALASKA						80*	40*	20				
ARGENTINA	20		40	40	40						15	15
AUSTRALIA	15					40	20	20	20			15
CANAL ZONE	20	80	40	40	40	40	20	20	15	15	15	20
ENGLAND	40	40	40	80				20	15	20		40
HAWAII	15	20			40	40	40				15	15
INDIA	15[1]	20[1]	20[1]				40[1]	20[1]	20[1]			
JAPAN						80*	40*	20				
MEXICO	20	80	40	40	40	40	20	20	15	15	15	20
PHILIPPINES								20				
PUERTO RICO	20	80	40	40	40	40	20	20	15	15	15	20
SOUTH AFRICA	20	40*							15	15	20	20
U.S.S.R.	40		40	40				20	20			
WESTERN UNITED STATES TO:												
ALASKA	15	20			40	40	40	40	40			20
ARGENTINA	15	20		40	40	40	40	40		15	15	15
AUSTRALIA	15	20	20				40	80*	40	15	15	15
CANAL ZONE	20	20		40	40	40			20	15	15	15
ENGLAND			80*						20	20		
HAWAII	15	15			20	20	20	20				15
INDIA		20										
JAPAN	15	20			40	40	40	40	40			20
MEXICO	20	20		40	40	40			20	15	15	15
PHILIPPINES	15	20					40	40		20		20
PUERTO RICO	20	20		40	40	40			20	15	15	15
SOUTH AFRICA	20	40[1]	40[1]							15	15	20
U.S.S.R.		40[1]	40[1]	40[1]	40[1]				20	20		
EAST COAST		80	80	40	40	40	20	20	20			

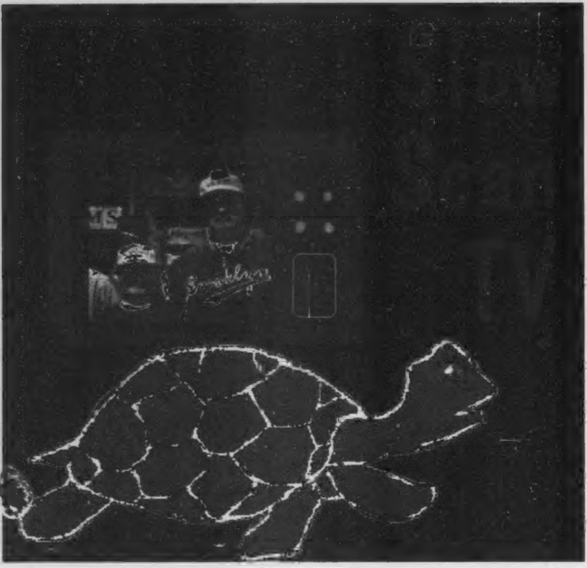
1Check next higher band
*Bp-Meters possible on good days only

DECEMBER 1995

SUN	MON	TUE	WED	THU	FRI	SAT
					1 F	2 F-G
3 G	4 G	5 VG	6 VG	7 VG-G	8 G	9 G-F
10 G-F	11 G-F	12 G-F	13 F	14 F-P	15 P	16 P
17 P	18 P-F	19 F-G	20 G	21G-VG	22 VG	23 VG
24VG-G	25 G-F	26 F	27 F-P	28 P	29P-VP	30 VP
31VP-P						

NEW PRODUCTS

Continued from page 80



FREE Slow Scan TV

Slow Scan TV is one of the most fascinating yet often neglected facets of Amateur Radio. Most people think it is poor quality black & white images using equipment costing kilobucks. That *was* true but isn't anymore.

John Langner WB2OSZ has written an interesting handbook containing sections on:

- How to get started
- Questions and answers
- Typical color images
- Commercial products
- Home-brew projects
- Much, much more

It is available for ***free*** in electronic form on the World Wide Web. The Universal Resource Locator (URL) is:
http://www.ultranet.com/~sstv
Contact John Langer WB2OSZ
john@world,std.com
115 Stedman St, Chelmsford MA 01824-1823 (508)-256-6907

Addresses and phone numbers for these fine products can be found on their ads in 73 or by writing 73's Review Department or by calling 603-924-0058.

Advance Design

Advance Design has just introduced the CK-53 Morse code monitor/keyer module. This unique product along with a PC and a radio allow the user to tune in the world of CW. The CK-53 is an assembled and tested, 2.5" X 3" PCB assembly which features an RS-232 interface to the computer, dual parallel speaker connections for audio, and an isolated relay contact keyer output.

The included terminal software allows easy, convenient communications. Eight buffers in addition to the 512 byte transmit buffer can be edited before transmission, either manually or by appending saved buffer data logged to disk allowing the user to save favorite QSOs.

Old West Graphics

Old West Graphics is happy to announce the release of Photo ID Name Tags for clubs involved in ARES, RACES, SKYWARN, SSC, and NTS. Professionally produce, these tags are 2.25" wide by 4" high, heat-laminated, with a 3" strap and alligator clip for you lapel. Official reps of local groups are the only people eligible to place orders, since these are law-enforcement-recognized identification. Each tag is $5 plus 30 cents shipping and handling. Write for the Photo ID Package, which contains all necessary information and a sample.

While you're at it, request Old West Graphics latest sign catalog and get a free surprise gift. Old West does t-shirts, custom ham radio street signs, sweatshirts, decals, banners . . . anything and anywhere you'd want your club logo or callsign. Latest product is a 4" by 8" hamshack callSIGN for $5.00.

New Product reviews and reviewers are welcome. Write to Ron at 73.

U.S. Repeater MapBook

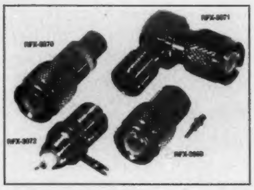
If you do any traveling you want to know where to find the local repeaters and what, if any tones it takes to use them. Artsci has a 147-page book of maps showing the locations of the open repeaters in the US, Canada, and Mexico. It also includes a CD-ROM data-base. And all this for only $29.95 from your local dealer, or direct from Artsci, Box 1428, Burbank CA 91507. Phone 818-843-4080.

Collins Amateur Equipment

For $22.95 pp you can get a nicely done 104-page 3.5" x 7" guide to Collins equipment made from 1946 to 1980. Well, almost all of it was made between 1946 and 1962, when the ARRL's so-called "Incentive Licensing" proposal put most of their dealers out of business, along with over 90% of the other manufacturers. Collins-lovers will enjoy this guide.

Free cable to connector cross reference

RF Industries announces the availability of a ***free*** Belden-Alpha-Times/RFI cable to connector cross reference guide. The guide enables you to easily select the appropriate RF connector to match the cable you are working with. The catalog is organized first by cable groups and second by the types of RF connectors available for these groups. The connectors are then divided into subgroups by type. The catalog is ***free***.

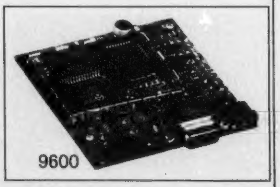


RF Industries announces the availability of FCC certified connectors.

According to the FCC, under certain applications it is illegal to replace a stock antenna with one that provides higher gain. In order to prevent this from happening, the FCC has issued an edict that calls for a unique connector thereby prohibiting the attachment of any other type of connector.

These connectors, which appear to be TNC but in actuality are not, comply with the guidelines set forth in FCC regulations. The 4 connectors include a male clamp for RF-174/316 (RFX-3059), antenna mount (RFX-3070), a right angle male to female adapter (RFX 3071), and a female bulkhead (RFX-3072).

NEUMOD 9600 High Speed MODEM



The NeuMod 9600 is a high speed, 9600 bps "Smart" modem designed to improve the quality and reliability of data communications over narrow band radio links. Its advanced protocol provides for 255 unique ID codes network configuration for both selective polling and/or group polling. Data transmission is either transparent or packetized, each packet is appended with both a source and destination ID code allowing point to point or point to multi-point of up to 255 points. When the NeuMod 9600 is integrated with the DCL-SYNX-U, it becomes NEULINK 9600, high speed "Smart" 2 watt modem transceiver.

LETTERS

Continued from page 82

has reminded me that there is more to amateur radio than slapping down a credit card to buy amateur radio gear. He reminded me of my father K6YPB, now a silent key, who was forever burning up the solder when I was a kid. He was always building something. I only wish it had not taken me 37 years to discover those same joys.

I do not have the electronic education he and others have, so I am like a new born, learning as I go. I joined a radio club in hopes to get "educated," but as it turns out, most have the same void as I do. Wayne taught me to quit sitting back and waiting for others. I had done some reading, and picked a topic of interest to the members and began to learn. I have put together two antenna-building parties and the next will be a soldering party. I have never experienced the type of satisfaction I get by helping others to build a project with their hands, and them being able to see and use the fruits of their labor. It is a wonderful feeling. Thank you Wayne.

This entire project was inspired by Wayne. It is my small attempt to help bring back the somewhat lost art of home-brew. With the exception of the 10 meter vertical, I built everything. The array consists of two 2 meter quagis phased together, two 70 CM quagis phased together, a 6-foot 440 MHz dish, a 23 CM and a 70 CM vertical. The tower is a 40-foot crank-up home-brew. The AZ/EL is controlled by surplus home TVRO satellite parts. The dish and quagis all move together in both AZ/EL for amateur satellite work. The whole works was brought up to a mountain top camp site for a club field day event last June. We had 80 members show up and we all learned and had a great time.

Thank you for *73 Amateur Radio Today.*

Rickey Nievera N2MBC Newcomers to amateur radio might want to know about a way they can work DX via 2m. Talk about radio fun! I'm using an Alinco Data Radio with an old Amiga 2000 and the MFJ 1278B TNC with the MFJ 1290 Multicom software and having fun with packet, working DX via the Internet. Here's what I do. I connect first to a local node and then to an Internet Gateway like N2MH-11, which is more than 50 miles away. At the prompt, I'm on the Internet. I type "/Who" and a long list of DX stations are listed, including a couple from Australia! It can take a long time to get through on the busier nodes, but there are a lot of channels, so you can move off for a private contact. Digital modes are here!

Ted Brattstrom NH6YK/KC6YK Just back from Palau and got caught up with the last few months of *73* and *Radio Fun.* OK, I'll attempt some articles for you on the joy of satellites and mini-DXpeditions (KC6YK—NH6YK/KH4—NH6YK/Kalawao County—NH6YK/ZL). However, I'd like to make one complaint, you've been bashing Techs lately and suggesting that they are not full members in the ham community since they are not operating on HF. Granted, many people stop at 2 meter repeaters (others seem to have stopped at 75m or 40m phone), *but* some of us use the satellites and not only work some great DX, but also have had some very interesting conversations. Of course the other modes are also fun. I've operated packet, TCP/IP, 6m, RS-10, AO-21, FO-20, RS-15, MIR, a bunch of shuttles (packet and voice for both spacecraft types), AO-10, AO-13. So the thing to do is to kick them into really using the spectrum they/we have access to. Granted, HF is fun too! As a Tech+ I've played on 10m phone and received my DXCC, but I've also had some great chats, such as an hour and a half with Trent Christian on Pitcairn. The path to North America closed for him, but he was strong into Hawaii, and we kept finding things to talk about. Then again, I've had exciting, if short, 10-minute chats with U5MIR, U3MIR, and Norm Thaggard (R0MIR). It doesn't take high power if there aren't other hams trying to contact them! And I've helped set up a SAREX contact with students from my school and another school. We had lots of fun with that! We simulcast it on the statewide RACES linked repeater system. Some hams and SWL (VHFLs?) got their first taste of space communications listening in! (Hmmm, do you want an article on that?) Alas, in almost five years of hamming, I've only convinced about 12 people to get their licenses. I ought to be getting way more than that since I am a high school chemistry teacher. But I definitely have added an awareness of radio to my students and colleagues. I'll have to grab that list of ham activities you wrote about and see how I do. I know I haven't worked DXCC in a weekend or done EME/ATV/Aurora, but I've been working at EME, and we are too far south for aurora, and drat, I'm always overseas playing when the Hawaii to West Coast duct is open. I wasn't too active in Palau this summer. The kayaking, diving, and snorkeling were fine, but the bands weren't in good shape. I operated 20M SSB and RTTY (my privileges in Palau are better than in the US!) as well as OSCAR 10 and 13. It was depressing to hear European stations calling CQ at S5 levels on 20M and then not to be heard by them. At least I made a few contacts with South America.

Ted, we've got 250,000 Techs and they're not *going for their General Class licenses, so I'm going to keep right on bashing until I see some results. Sure, the code is a nuisance, but we've got kids seven years old with their Extra Class tickets, so unless someone is seriously mentally challenged (as they put it these days), they can learn the damned code. Wayne*

Don Lakenmacher N5UNU On Field Day, my wife AB5RI and I were driving through Wyoming on vacation. We were using a Yaesu 757GX into a 6-foot mag-mounted Outbacker. My wife was driving while I was working a W2 on 20 meters. We were moving along at about 60 mph when suddenly we were hit by a blast of wind which knocked the antenna off the top of the Suburban. She pulled over as soon as she could, but the antenna was dragged quite a ways. I checked the damage: a big dent in the side of the car, a ground-up mag mount, sans magnets, and a well-traveled Outbacker with only half of its stinger and lots of new character marks. But the W2 was still coming through nicely and the antenna still works just fine. Tough rascal.

Steve Loritz KC7COI After reading your editorials for the past three years and coming across two back issues from the mid-seventies at the used bookstore I work at, I am compelled to write you.

I've been interested in cold fusion since reading about it in your editorials and (surprise!) not reading about it anywhere else. Unfortunately, my local library is a bit anemic in the information department so I'll ask you where I can find more information. Some time ago I ran across a copy of your *"Cold Fusion"* magazine at a bookstore, but could not afford the stiff cover price. Be that as it may, my wife and I are very interested in taking advantage of getting in on the ground floor of this tremendous opportunity. Can you help us? Your guidance would be most appreciated.

A couple of other things to pass along to you and anyone else: I have been reading a couple of books that those subscribers to *73* who still read might like to take a look at. The first is Joel Barker's *Future Edge*, published by William Morrow and Co., New York, ISBN 0-688-10936-5. Joel's book will help you be ready for opportunities that will arise in the future and, if you are willing to turn off the TV and get up and do something, give you the tools for success. This book deals with recognizing the paradigms that people and industry have been slaves to when paradigm paralysis sets in and holds them down while those whose anticipation of change, innovative thinking, and drive for excellence causes them to pick up the ball and run. A few examples are in order: digital watches, microcomputers, small energy-efficient cars, total quality management, et al. There is no secret to the success of the leaders in these fields—just an open mind.

Book number two, *The McDougall Plan* by John A. McDougall MD, published by New Century Publishers, Inc., ISBN 0-8329-0289-6. This book is all about health-supporting diet and lifestyle. If you're tired of paying your doctor a king's ransom for outdated, often food-industry driven false information designed to support him and the pharmaceutical industries, read this eye-opener. It will help you feel better, look better, get your colon regular and allow your body's ability to heal itself save you time, aggravation, and money. John's book exposes the fairy tales that our school system and the food/health industry have been propagating for decades. Wait until you

Continued on page 88

Uncle Wayne's Bookshelf

REFERENCE

RS-1 **The Amateur Radio Mail Order Catalog and Resource Directory, 4th Edition** is the most comprehensive source book for electronic parts, software, and equipment targeted at the radio amateur or serious electronic hobbyist anywhere! Plus a wealth of "value-added" reference material all in 262 pages. 4th Edition clearance at only **$8.95**. (was $16.00)

TAB2701 **Transmitter Hunting** *by Joseph Moell and Thomas Curlee* Radio direction finding simplified. **$19.95**

UE202 **RTTY Today** *by Dave Ingram* Modern guide to amateur radioteletype. **$8.95**

TP002 **The World Ham Net Directory** *by Mike Witkowski* New—2nd edition. Introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

WGP87158 **1995 North American Callbook** The 1995 North American Callbook lists the calls, names, and address information for 500,000+ licensed radio amateurs in all countries of North America. **$35.00**

MMH24 **Radio Handbook, 23rd Ed**. *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. **$39.95**

WGP1234 **1995 International Callbook** The new 1995 International Callbook lists 500,000+ licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$35.00**

AR4092 **Your RTTY/AMTOR Companion** invites you to explore the world of HF digital communications. If you've never operated RTTY or AMTOR before, this book is written expecially for you! You won't find complicated technical jargon here. Just information you can use right away. You'll discover how to . . . Assemble your own RTTY/AMTOR station . . . Use RTTY and AMTOR to talk to amateurs throughout the world . . . Compete in RTTY/AMTOR contests . . . Hunt for digital DX. **$8.00**

AR3754 **Radio Frequency Interference—How to find it and fix it.** Interference problems are challenging, but curable. With the techniques in this book, you can help restore electronic peace in your neighborhood. **$15.00**

DOV41 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Covers the important aspects of applied electronics and electronics communications. **$12.95**

DOV76 **Second Level Basic Electronics** *Prepared by the Bureau of Naval Personnel* Sequel to Basic Electronics, thorough treatment of the more advanced levels of applied electronics. **$9.95**

20N096 **How To Read Schematics (4th Ed.)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. **$19.95**

WLSWOCP **Radio Operator's World Atlas** *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. **$17.95**

TAB37109 **Secrets of RF Circuit Design** *by Joseph J. Carr* Written in clear non-technical language, covers everything from antennas to transistors. **$21.95**

TAB11065-1 **Mastering Radio Frequency Circuits** by Joe Carr, 411 p. If you're interested in learning about radio components and circuits, this book is great! Plus there are a ton of simple circuits you can build. It explains how circuits work, about test equipment, receivers, the works. This will take a lot of the mystery out of how radios work . . . the easy way. This will be one of your better $20 ham investments. **$20.00**

DP919 **73 Magazine Index 1960-1990** A complete index to every article published in *73 Magazine* through 1990. IBM software **$20.00**

NEW BOOKS

AR4920 **Introduction to Radio Frequency Design** In this practical book, the author emphasizes use of models and their application to both linear and nonlinear circuits, reviews traditional material stressing the viewpoints taken by the RF designer and illustrates subject material by numerical examples. Includes 3 1/2 inch disk for IBM PC or compatibles. **$30.00**

R&D57450 **Raptures of the Deep** *by Fred Jueneman* What we understand in science today, and the challenges facing scientists in just about every field. An incredible job of research on how and why scientists believe what they do about our world and how it works. **$29.95**

GEI3579 **Final Quantum Revelations** Dr. Kiril Chukanov uses not only science but revelation to answer difficult and profound questions about physical reality and cosmic destiny. **$34.95**

TEC7787 **Exploring the Physics of the Unknown Universe** *by Milo Wolff* Packed with intriguing discussions like, What is the origin of the laws of physics? and What is the nature of space? A simple and readable book on how mathematics describes the physical universe and what paradoxes and enigmas remain for an enterprising mind to solve, with speculations on the nature of subatomic particles as standing interference patterns of spherical waves. **$39.00**

SHORTWAVE

NBPAW94P **1995 Passport to World Band Radio** *by International Broadcasting Services, Ltd* You'll get the latest station and time grids. **$19.95**

07R25 **The RTTY Listener** *by Fred Osterman* New and expanded. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter*. Contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. **$19.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. **$14.95**

CRBSM1 **Scanner Modification Handbook, Vol. 1** *by Bill Creek* provides straightforward step-by-step instructions for expanding the operating capabilities of VHF scanners. **$17.95**

CRBSM2 **Scanner Modification Handbook Vol. 2** *by Bill Creek* Here it is—a companion to Vol. I. In fact, Vol. 2 has a section that provides improved approaches and updated techniques for the mods in Vol. 1. There's 18 new exciting modifications for popular scanners. **$17.95**

TAB 339643 **Tuning In To RF Scanning** From Police to Satellite Bands. Bob Kay. 150p 1994, Tab Books. This is a wonderful book for the VHF-UHF scanner listener. It explains about the various radio bands, antennas, the laws, and lists frequencies for every imaginable service . . . including the Secret Service, FBI, military, IRS, prisons, Fish & Wildlife, McDonald's order windows, nuclear search teams, railroads, Russian satellites, Treasury Dept., wireless microphones for concerts, and so on. **$14.95.**

07A66 **Aeronautical Communications Handbook** *by Robert E. Evans* Exhaustive, scholarly treatment of shortwave aeronautical listening. **$19.95**

AR4025 Beyond Line of Sight. Shows how hams pushed forward the discovery of the propagation modes that make VHF DX possible: tropo, sporadic-E, aurora and auroral-E, meteor scatter, F-Layer propagation, transequatorial propagation and earth-moon-earth. **$12.00**

TAB 447748 **The Shortwave Listener's Q&A Book**—Everything you need to know to enjoy Shortwave Listening. Choosing receivers, accessories, antennas, frequencies, and getting QSLs. SWL is an exciting hobby . . . that's what got me interested in hamming . . . Wayne. **$12.95**

WAYNE'S PICKS

WG2 **The Million Dollar Video** Explains how just about any company can increase sales by over a million dollars through the sneaky (aka intelligent) use of promotion. Explains in detail how you can get tons of free advertising. Uncle Wayne shows you how to beat the system. **$39.95**

"SEEK YOU" by The Ham Band—The titles include "Always on the air", "On the Monday Evening Grayline", "Radio Widow", "The Trip to Dayton", "The Contest" and seven more. Ham radio CD includes experiences that radio hams go through. This is an extremely entertaining CD and will strike a chord with any radio ham, SWL or XYL—an ideal present! **SYCD $15 SYTAPE $10.**

IB8657 **Dumbing Us Down: The Hidden Curriculum Of Compulsory Schooling.** *by John Gatto* If you enjoyed "Declare War", you'll enjoy this also. A Wayne Green recommended reading. **$9.95.**

WG1H **LEARN THE CODE** There are two ways to learn the code, (1) the easy way, (2) everyone else's way. Your choice. There are two speeds of code you need to know — one (5 wpm) you can learn in less than an hour, the other (20 wpm) takes longer, but nowhere near as long as you probably think. Sure, you can also learn it at 13 wpm, if you want, but that just wastes your time.

Learning to copy code is just like learning to type or play the piano, if you have to stop and think, you can't do it. It has to be made automatic, so if you go the usual code training route of starting slow and speeding up you are screwing up. That brings you to that dreaded plateau at about 10 wpm, where you've reached the brain's clock speed. Then you have to start all over from scratch and do it the way you should have in the first place. With Uncle Wayne's tape you start right out at 20 wpm and train your hand to write what your ears hear.

Uncle Wayne gives you a choice on the 5 wpm code test. You can either buy the El Zippo one hour method of passing the test, which is enormously over-priced at $5 (order 73-EZ), or you can buy two tapes . . . one, The Genesis, takes about an hour to teach you the code characters ($5.95 — 73T05) and the other, The Stickler ($5.95 — 73T06) gives you an hour of fiendishly difficult practice at 6 wpm. Then there's the 13 wpm Back Breaker ($5.95 — 73T13), in case you for some masochistic reason want to bother learning the code at 13 per. And the ever popular Courageous 20 wpm tape ($5.95 — 73T20). If you find you've become a code fanatic, there's the 25 wpm Mind Boggler ($5.95 — 73T25) which will serve you right.

Until wiser herds . . . er, heads . . . are able to dump the code requirement from the ham exams, the El Zippo and Courageous are the least frustrating route to ham nirvana. And by the way, anyone can learn the code if they go about it Uncle Wayne's way.

SOFTWARE

GGTE Morse Tutor From beginner to Extra Class. Code from 1 to over 100 words per minute. Standard or Farnsworth mode. Create your own drills. Exams conform to FCC requirements. 5 1/4" floppy for IBM PC, XT, AT, PS/2 or compatibles.

GG52/5 Morse Tutor 5.25" Disk	**$19.50**
GG31/2 Morse Tutor 3.5" Disk	**$19.50**
GGADV5 Gold Edition 5.25" Disk	**$29.95**
GGADV3 Gold Edition 3.5" Disk	**$29.95**

W5GWHO **Ham Operator Education Package Software**, Novice—Extra for PC's, contains both 3 1/2" and 5 1/4" disks. **$39.95**

W5GWNSW **No-Code Ham Radio Software Package for PC's,** contains both 3 1/2" and 5 1/4" disks. **$29.95**

Lanze Code Programs—(Available on 5 1/4" * disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
Novice	LZIBM01	LZCOM01	**$14.95**
Tech	LZIBM02	N/A	**$14.95**
General	LZIBM03		**$14.95**
Advance	LZIBM04	N/A	**$19.95**
Extra	LZIBM05	LZCOM05	**$19.95**

* Add $2.00 for 3 1/2" Disk

VIS Study Cards Compact, up-to-date Flash Cards with Key Words, Underlined, Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

NOVICE	VIS01	**$11.95**
TECH	VIS02	**10.95**
GENERAL	VIS03	**9.95**
ADVANCED	VIS04	**15.95**
EXTRA	VIS05	**14.45**

LAST CHANCE ITEMS

ONLY A FEW LEFT

SAM22488 **IC User's Casebook** A 'must' for any hobbist's workshop, covers ideal operation amplifiers, inverting and noninverting followers, linear amplifiers, active filters, digital circuts and waveform generators and timers. **$12.95**

SAM48441 **178 IC Designs & Applications** A comprehensive collection of linear developments for electronic design and basic applications. **$12.95**

ARRL BOOKS

AR1995 **ARRL 1995 Handbook (71st Ed.)** Features: added DSP, improved treatment of Pi and Pi-L, all new all-digital-logic, plus lots more. **$30.00**

AR1086-4 **ARRL Operating Manual (4th Ed.)** Information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF. **$18.00**

AR3657 **QRP Notebook** *by Dave DeMaw W1FB* Presents construction projects for the QRP operator. **$10.00**

AR3207 **W1FB's Design Notebook** *by Dave DeMaw W1FB* Filled with simple practical projects that can be built using readily available components and common hand tools. **$10.00**

AR0402 **Solid State Design** Good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. **$15.00**

AR4173 **Now You're Talking! All You Need To Get Your First Ham Radio License (2nd Edition)** A complete study guide for the Technician and Novice written exam. Practical information every beginner needs is written clearly and simply and in small doses. **$19.00**

AR4971 **ARRL Repeater Directory 1995-1996** 19,000+ listings with digipeaters, bandplans, CTCSS (PL(TM)) tone chart, frequency coordinators, ARRL special service clubs, and beacon listings from 14 MHz to 24 GHz. **$7.00**

AR3398 **The DXCC Companion** *by Jim Kearman KR1S* Spells out in simple, straightforward terms what you need to be a successful DXer. **$8.00**

AR1250 **Log Book**—Spiral **$3.50**

AR3177 **The ARRL Spread Spectrum Source Book.** From a deceptively simple beginning, a group of experimenters set out to develop first theoretical and later practical systems for spread spectrum communications. This book consists of articles, papers and government reports that document the process whereby amateur spread spectrum progressed from the drawing board to the airwaves. **$20.00**

AR2960 **Transmission Line Transformers (2nd Ed.)** *by Dr. Jerry Sevick W2FMI* Practical designs and specific information on construction techniques and sources of material. **$20.00**

AR3851 **Hints and Kinks** Ideas for setting up your gear for comfortable, efficient operation. **$10.00**

ARRL License Manuals Complete FCC question pools with answers.

AR4181 **Technician Class**	$ 6.00
AR4688 **General Class**	$12.00
AR3274 **Advanced Class**	$ 8.00
AR3282 **Extra Class**	$ 8.00

AR3185 **The Satellite Experimenter's Handbook, (2nd Ed.)** *by Martin Davidoff K2UBC* Expanded and revised. Focusing on satellites built by and for the international radio amateur community. **$20.00**

AR2030 **Your Gateway to Packet Radio (2nd Ed.)** Tells everything you need to know about this popular new mode. **$12.00**

AR4645 **Satellite Anthology** The latest information on OSCARs 9 through 13 as well as the RS satellites, the use of digital modes, tracking antennas, RUDAK, microcomputer, and more! **$10.00**

AR4483 **Weather Satellite Handbook (4th Ed.)** *by Dr. Ralph Taggart WA8DQT* Expanded and revised to reflect today's weather-fax satellite technology. **$20.00**

AR4653 **Companion Software for Weather Satellite Handbook** 5 1/4" MS-DOS Floppy. **$10.00**

AR2083 **Complete DX'er (2nd Ed.)** *by Bob Locker W9KI* Learn how to hunt DX and obtain hard-to-get QSL cards. **$12.00**

AR3762 **Your QRP Operating Companion** No special rigs or expensive equipment to enjoy the excitement and challenge of low-power operating. **$6.00**

AR3169 **QRP Classics** Compilation of ARRL publications on building receivers, transmitters, transceivers, accessories. **$12.00**

AR4270 **FCC Rule Book** A must for every active radio amateur. **$9.00**

AR0356 **Morse Code: The Essential Language** *by L. Peter Carron, Jr. W3DKV* Expanded and revised in its 2nd edition. How to handle distress calls heard not only on the hambands but on maritime and aircraft frequencies. **$6.00**

AR3983 **Understanding Basic Electronics** An ARRL book. 314 big pages. This explains everything very simply: the math, DC, AC, transistors, even tubes (wow!). Dirt cheap at $17. Isn't it about time you understood the fundamentals? **$17.00**

ANTENNAS

AR4114 **Low Profile Amateur Radio** For the Ham who lives where antennas are frowned upon. From hiding your antenna to operating with low power. This books tells you how to get on the air using these tehniques, and others,without calling attention to yourself. **$8.00**

UE220 **The Easy Wire Antenna Handbook** *by Dave Ingram K4TWJ.* All of the needed dimensions for a full range of easy to build and erect "sky wires." **$9.95**

WGP87034 **All About Cubical Quad Antennas** *by William Orr and Stuart Cowan* "The Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$11.95**

TAB 3270P **Practical Antenna Handbook**—Second Edition, 1994, Joseph Carr; Tab Books. This 560-page book is a real treasure. Sarts with the fundamentals of antenna and feedline theory, explains about propagation of all kinds, and then provides a ton of easy antenna construction projects. Covers antennas and feeders for all bands. The explanations are simple and well illustrated, with some math, where it's unavoidable, but it won't bog you down. It even has the ZL-Special antenna, which I've used on 20m with some spectacular DXing success. A low angle of radiation and made it so I could always work the rare stuff first . . . Wayne. **$26.95.**

AR4734 **ARRL Antenna Book** The new 16th Edition represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. **$30.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization. **$10.00**

AR2545 **Antenna Compendium Vol. 2** Covers verticals, yagis, quads, multiband and broadband systems, antenna selection. **$12.00**

AR2626 **Companion Software for Antenna Compendium Vol. 2** 5 1/4" MS-DOS floppy. **$10.00**

AR4017 **Antenna Compendium Vol. 3** More verticals, yagis, quads, plus loops, arrays, mobile, direction finding, controlled currents, computerized, installation, overloads, plus 40 new articles for beginner's to advanced. **$14.00**

AR4661 **Antennas and Techniques for Low-Band DXing** can be your ticket to low-band success. Drawing on the experiences of successful DXers and the author's own considerable experience, John Devoldere, ON4UN, shares the tips and techniques that can make the difference between a station that takes part in a contest and one that wins it! **$20.00**

AR3819 **Physical Design of Yagi Antennas** *by David B. Leeson W6QHS* provides the tools here to design and build robust Yagi antennas, using sound mechanical engineering principles. You need no longer fear the consequences of wind or ice storms on your antennas. With this information, you can build or "beef up" existing Yagis. **$20.00**

AR2618 **W1FB's Antenna Notebook** *by Dave DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$10.00**

WGP87107 **All About Vertical Antennas***by William Orr* Comprehensive coverage of amateur communications. **$11.95**

WGP87042 **Beam Antenna Handbook** *by William Orr and Stuart Cowan* Everything you need to know about beam design, construction, and operation. **$11.95**

WGP87077 **Simple, Low-Cost Wire Antennas For Radio Amateurs** *by William Orr and Stuart Cowan* All New! Low-cost, multi-band antennas; inexpensive beams, "Invisible" antennas for hams in "tough" locations! New data. **$11.95**

AR2200 **Antenna Impedance Matching** *by Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **$20.00**

AR0410 **Yagi Antenna Design** A *Ham Radio* series polished and expanded by Dr. Lawson. **$15.00**

AR2995 **Reflections** will help dispel the half-truths and outright myths that many believe are true about transmission lines, standing waves, antenna matching reflected power and antenna tuners. **$20.00**

AR3118 **Reflections**—Software for IBM 5-1/4" **$10.00**

UHF/VHF/PACKET

ARTSCI **U.S.Repeater Mapbook** *by Robert Martin* The Guide for traveling radio amateurs. **$9.95**

TP001 **The Basic Guide to VHF/UHF Ham Radio** *by Edward M. Noll* Provides a first rate introduction to the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. **$6.95**

AR3959 **Your Packet Companion** Perfect for the packet newcomer. **$8.00**

AR3878 **Your VHF Companion** Explore the fascinating activities on the VHF bands, FM and repeaters, packet, CW & SSB, Satellites, ATV, transmitter hunting and more. **$8.00**

03R02 **RTTY Today** *by Dave Ingram K4TWJ* Most comprehensive RTTY guide ever published. **$8.50**

BOOKS FOR BEGINNERS

TAB4354 **The Beginner's Handbook of Amateur Radio, Third Edition** *by Clay Laster W5ZPV*, 395 pages. Wonderful book for newcomers. It is basic and well illustrated. Even if you have all the other ham handbooks, you'll still find this one useful. **$22.00**

W5GWNV **No-Code Video, Manual, Part 97 Rules** Learn how to be a ham radio operator. **$29.95**

W5GWNC **Technician Class License Manual: New No-Code** *by Gordon West* This book covers everything you need to become a Technician Class Ham. Every question and answer on the examinations is found in this one book. FCC Form 610 application. **$9.95**

XTAL-1 The Crystal Set Handbook by Phil Anderson W0XI. Want to give a kid an exciting present? Or maybe yourself? Crystal sets are alive and fun. Here's a whole book packed with crystal set circuits that anyone can build. Now start saving those oatmeal boxes, okay? 133 pages **$10.95**

WAYNE WRITES

WG1 **We The People *Declare War* On Our Lousy Government**—360p soft cover. This is Wayne's report explaining what the major problems are facing both New Hampshire and the country, and proposing simple, inexpensive solutions: a simple way to have government departments happily cut their expenses by 50% within three years; how to cut the cost of incarcerating prisoners by over 90%; how to end welfare; how to reduce the deficit; how to cut medical costs and improve health care; how to cut school costs and improve schools. An absolute steal at **$13**.

WG4 **20/20 Foresight**—Twenty 16p updates on the **Declare War** book—320p. Further proposals for solving critical American problems, such as a new approach to financing small businesses, how to finance Russia and other countries and make a profit doing it, the real dope on bioelectromagnetics, a new kind of polytechnical university, a new electronics technology, why Africa is in such a mess, why Perot bombed, how to have tuition-free universities, a plan for making Congress turn honest, etc. Plenty more. Ridiculously priced at **$10**.

WG5 **Submarine Life in WWII**—60p. Wayne's story of his adventures on the USS Drum SS-228 on five war patrols in the Pacific in 1943-45. What's it really like on a submarine when you're being depth charged? And what's the day-to-day life on a submarine like? Did you see the movie Das Boot? Exciting stuff and only **$7.50**.

WG6 **Uncle Wayne's Caribbean Adventures**—96p. Wayne's adventures scuba diving all around the Caribbean, visiting ham operators, and sightseeing. If you're interested in how to travel economically, you'll get some great ideas from this. He starts out with his "Diving, the Wimp Sport." You'll love the visits to 11 islands in 21 days trip. A measily **$7.50**.

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LETTERS

Continued from page 85

read about how our culture's acceptance of rich foods like meat and dairy as the cornerstone of diet have led to increased disease rates, cancer, fat kids, poor tests scores, lower intelligence . . . and on, and on, and on. Why do you think people with starch-based, health-supporting diets like those in Asia, the Middle-East, and elsewhere have lower cancer and disease rates, smarter kids, and longer life expectancy?

Enough of that. Wayne, we are having a hard time putting ideas to action. What will it take to get everyone going? Thanks a million.

Steve, I've been trying to get the old duffer hams off their fat butts and into new technologies for 44 years now, so I doubt that your letter will break many away from Gilligan's Island re-runs, or spending hours checking into 75m nets to report no traffic. Wayne

Luke Gow VK2GXQ My name is Luke and I am a 14-year-old high school student in NSW, Australia. Although I have only been on a short time I have been very active on the ham bands. I hold the 'Full Call' license which is the highest of the four Australian classes and I may work all modes and all bands. My Dad is also a ham and we are both constant readers of *73 Magazine*, although the issues are a couple of months behind because of shipping to VK. I designed my own QSL card which I have included for you, perhaps you may consider it for QSL of the Month. I drew both the koala and kangaroo freehand before scanning it with my "Typist" Caere Scanner so I could edit the pictures on my Apple Macintosh LC computer. After editing the Koala and Kangaroo, I added clothes to the animals. The kangaroo's shirt bears "VK" for Australia. As my two major interests, besides amateur radio, are surfing and playing guitar, I decided to include a surfboard and Gibson guitar on the card also. The koala is standing with the surfboard in the sand, while the kangaroo is holding the guitar and a flag in his hands. The flag shows a basic map of Australia and has been colored green and gold, Australia's national colors. I then colored the animals using Pixel Paint, a Macintosh paint program. After setting the text I printed the finished card on my Deskwriter C Inkjet printer. I enjoy working the states and in the three months I have been on the air I have worked 46 states and have 33 confirmed. I am only waiting on Maine, Delaware, North Dakota, and Idaho to contact. The whole family enjoys reading the magazine, keep up the good work.

Rusty Chamberlin WA5PDG. I first subscribed to *73* when I was a junion at LaFeria High School (Texas), over 30 years ago. You are truly an inspiration. Your curiosity, your optimism, your belief in the individual, and your belief in free markets inspires many of us. Keep up the good work. *(Thanks Rusty, but there's so much more that needs to be done that I need a clone — Wayne)*

Jerry Richter K1IWY. Oh Uncle Wayne, you sly old devil, you. How did you ever come to possess the uncanny ability to become a Monday morning quarterback the day before the game in all matters of the world, including your analysis of our fine government? As I listen to the strains of "The Star Strangled Blander," I salute you. Your May editorial relating to "Work Ethic" and "Management" was right on. Ooooh! Made me feel gooood! Being a federal gov't/Navy retiree, I could relate to both areas and on both sides of the coin. 38 years Naval Reserve and 32 years in the federal government. Amazing, isn't it, how our system operates? I'm really convinced that the government is operated 100% on the Peter Principle. Remember the one where people get promoted to the maximum level of their incompetence and then are transferred to another department and the process starts all over again? Well now, doncha' know we have all these Peters floating atop the workers, who are the real backbone of their organizations, and what happens to the really competent people? You got it. During my 32 years as a government employee I've seen upper management spend entire spring sessions sitting around the office, planning golf tournaments. No, not on their breaks. During work hours. I've witnessed first hand directors telling counselors to drop the sexual harrassment charges filed against supervisors because it would be an embarrassment. You wouldn't believe what the military brass does. Or maybe you would, Uncle Wayne. Our tax payers would rally on the White House steps if they knew what went on with their tax dollars. Like a full bird colonel spending $3,000 of taxpayers money to plant flowers because a three-star is coming, but then doesn't provide for watering, so they all die later. How about the GS-14 that was caught several times flagrante delicto with an office sweetie. Was he punished? No, he was transferred with no loss in pay and the people who turned him in were punished. Ooops, I forgot, this is a ham radio magazine. Great publication! Keep it up please. See what your editorials do to people?

Jerry, you really should write a book! When I found out what was going on that most people don't know about, I wrote one... Wayne.

See Green Team help wanted ad bottom of page 83, November 1995, 73 Magazine

BARTER 'N' BUY

Continued from page 71

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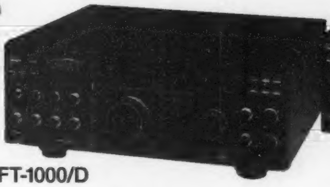
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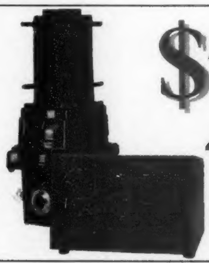

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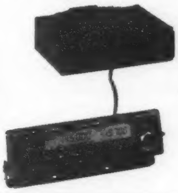
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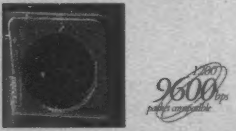

* permits required for MARS and CAP use. Specifications guaranteed for Amateur bands only.

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For the added safety, you can choose the quick-release detachable front panel kit (option). The transceiver unit can be concealed under a seat or in the trunk.

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▮ 72 multi-function memory channels ▮ AIP (Advanced Intercept Point ▮ Built-in DTSS with page ▮ Cross-band repeater ▮ Wireless clone function ▮ Wireless remote function ▮ Auto simplex checker ▮ Built-in CTCSS encoder & optional TSU-8 decoder ▮ Key function display ▮ Modifiable for MARS/CAP*

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TM-742A

101 Memory Channels

For each band, there are 100 memory channels plus 1 call channel. Each channel can store transmit and receive frequencies independently or odd split repeaters.

TM-642A

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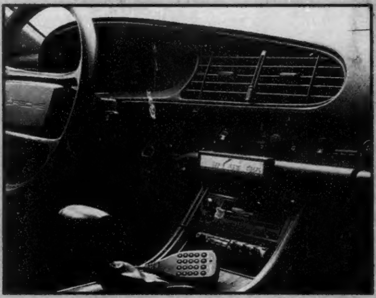
The display and controls can be mounted separatelyon either side of the steering wheel, for example — while the main unit is concealed in the trunk.



Other Features

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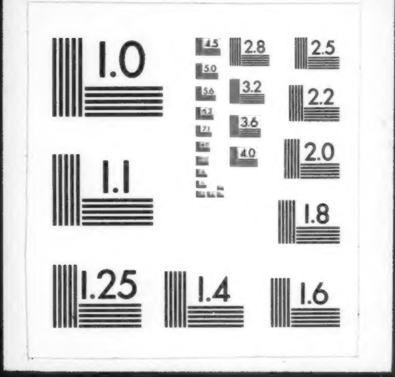
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